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RAIL-ROADS IN THE KINGDOM OF BELGIUM COMPARED WITH THOSE IN THE UNITED STATES.

By the CHEVALIER DE GERSTNER.

The rapid increase of internal improvements in the United States has excited for several years public attention in Europe, and the friends of those improvements desired very much a detailed report on the extent and progress of those works, and particularly of *rail-roads*. There is no such report published in the United States, and even those published in England, France, and Germany, are very imperfect.

In 1824 I had charge of the first rail-road on the continent of Europe to connect the rivers Moldau and Danube in Austria, by a line which is 130 miles long, and since 1832 in operation. I constructed in 1836 and 1837 the first rail-road in Russia, from St. Petersburg to Zarskoe-Selo and Pawlowsk, a line of only 17 miles in length, but the commencement of a rail-road of 420 miles from St. Petersburg to Moscow. This rail-road being likewise in full operation, I left Europe last fall, and arrived in the Great Western on the 15th of November 1838, at New York. After a short stay of a few days, I went to Albany and inspected all rail-roads between that place and Lake Erie; I then proceeded to the eastern states and visited all rail-roads in Massachusetts, and went *via* New York, Philadelphia, Baltimore, Washington, through Virginia, North and South Carolina, Georgia, and Alabama, to New Orleans, always visiting the rail-road lines in the different states. I went then up the Mississippi and Ohio, and am now inspecting the internal improvements of the western states and some of those in Pennsylvania, which I have not yet seen.

I have already passed over more than 2000 miles of rail-roads, and have every where been received with the greatest kindness; the presidents, directors and engineers of the different rail-road lines gave me not only all their printed reports, but laid before me, with the greatest liberality, their books and accounts, in order to give me every kind of information. I fulfil only my duty when I publickly acknowledge that such a liberality is only to be found amongst a free and enlightened people, where all public works are based on the principle of publicity, and where secrets do not exist. I wish, therefore, to make those gentlemen, to whom I am so much indebted, another communication, which will show at the same time what has been done during the last years in Europe. Having within a few days received the last reports of the Belgian rail-roads, I publish in the following abstract the history and progress of those communications in Belgium, together with a comparison of them with the American rail-roads.

According to the facts collected during my travels since my arrival in New York, there are now over *three thousand miles of rail-roads completed and in operation in the United States;* 425 locomotives, of which the greatest number were made in this country, run on the several rail-roads; and I believe, that up to the end of 1839, the length of rail-roads in the United States may amount to 4100 miles. The capital expended on the rail-roads now in operation is about sixty millions of dollars, or at an average cost of twenty thousand dollars per mile, for which sum the rail-roads, with the buildings, have been constructed, and the necessary locomotives and cars bought.

Several rail-roads have been undertaken with insufficient means, and the shareholders found themselves under the necessity of employing the income of the first years in improving the rail-road, in building engine-houses, &c. and purchasing locomotives and cars. In consequence of this, the shareholders got during that time no dividends, but the rail-road still yielded a good income. Other rail-roads, when finished, paid from five to ten per cent. income to the stockholders; others have not yet paid any dividends for want of a sufficient number of passengers and freight. The *average result* of the rail-roads now in operation in the United States is, *that they give a yearly interest of five and a half per cent. on the capital invested.* This result must be regarded as very satisfactory, because the greatest part of the lines have only been a few years in operation.

On all lines there is a yearly increase of at least 15 to 20 per cent. in the gross income, so that even those lines which do not pay now, will give, in a few years, a handsome dividend. According to these statements, based on the communications collected in this country, I have no doubt, that the large capital invested in rail-roads, in the United States, will not only produce an incalculable benefit to the country, but likewise pay the shareholders a dividend, which under good management, by the constant progress in poulation and trade, must likewise from year to year increase.

A good book-keeping, and clear accounts, is in every business a matter of importance; rail-roads are new constructions, and experience, particularly in working them, is still very much wanted. When the superintendent of a rail-road in operation keeps clear and distinct accounts, he will in a few years learn by experience what can be improved, and which items of expenses can be reduced. The following statement contains a manner of making the rail-road accounts, which in my opinion must prove very useful for every rail-road company.

I. *History, length and cost of construction of the Belgian rail-roads.*

The rail-roads, which up to the present time have been constructed in England and on the continent of Europe, had no other object than to connect two important places of the country, and in constructing them, therefore, only a local interest more or less prevailed. That rail-roads are to be considered *as great thoroughfares*, that they can form in a country the principal lines of internal communication—that, therefore, the means for their establishment should be such, as only can be raised by a whole nation, nobody in Europe would maintain previous to the year 1834, and is even now denied by many individuals of high

standing and influence. Belgium, united with Holland since 1815, had distinguished itself in Europe, by its fine roads, and magnificient canals; the latter, being constructed for the greatest part in a level country, and without locks, were used not only for the transportation of goods, but also for passengers, especially the lower classes, which there, more than in any other country, made use of the canal boats for their travels. It is evident, that no individuals would ever have attempted to construct rail-roads parallel and in opposition to such canals and turnpike roads.

In the year 1830, Belgium declared itself independent of Holland, and elected by the representatives of the nation its own sovereign. KING LEOPOLD I. soon discovered, that the country, for its perfect tranquillity, wants "labor"; a series of wise legislation encouraged the nation to useful and profitable enterprises, and every person with talent and inclination found employment and earnings in a country, which isolated from all its neighbors, was confined to its own resources. But to gain the public opinion, a great national work was to be accomplished by the new government, able to fill posterity with admiration. The time was past for Egyptian pyramids, for Roman triumphal arches, and French monuments of war. A more useful monument, one of peace and intelligence, should remind the nation of that eventful period. The king ordered the whole country to be surveyed by able engineers, the necessary plans and estimates formed, and on the first of May 1834, a law was proclaimed, according to which *a system of rail-roads should be introduced through the whole kingdom, and executed at the expense of the state;* on two points (at Antwerp and Ostend), the rail-roads were to lead to the seaports, on two points to connect with France, and on one point with Prussia (Germany).

The news of the gigantic work, undertaken by a state, even not yet acknowledged as such by the northern powers, and with only four millions of inhabitants, excited the greatest surprise in Europe, and few only could conceive the great results, which this grand project must necessarily produce *on the independence of the nation and its internal welfare*, its commerce and industry; the former being the principal aim, and the promotion of commerce and industry a subordinate one, although the great mass of the people were unable to comprehend the grand idea of the plan.

KING LEOPOLD found in his former minister of public works, Mr. De Theux, and in his successor Mr. Nothomb, vigorous supporters. The engineers were vying in the swift prosecution of the work, and in the course of four years more has been done than was expected. The enligtened minister Nothomb published annual reports to the legislative assembly, besides other special reports of the progress of the works, in which the public in Europe find a rich source of experience, not to be met with in any report or work on the subject. Europe has to render thanks to the king, who the first realized such a grand idea, and to his enlightened minister, who judiciously conducted the work, and so liberally communicated its results.

The limited space of this report does not allow a detailed extract from the above mentioned reports of the minister Nothomb and the engineers; I shall therefore only give a brief account containing the results in numbers, and afterwards compare these results with those of rail-roads in the United States. The following table contains the sections of the rail-roads which were opened until the end of 1838, and their lengths in metres and English miles.

SECTION OF RAIL-ROAD.		*Time of opening.*	LENGTH.	
From	*To*		*In French Mètres.*	*In English miles.*
Brussels,	Malines,	5 May, 1835	20,300,	12.6
Malines,	Antwerp,	3 May, 1836,	23,500,	14.6
Malines,	Termonde,	2 Jauuary, 1837,	26,700,	16.5
Malines,	Louvain,	10 September, 1837,	23,750,	14.7
Louvain,	Tirlemont,	22 September, 1837,	17,750,	11.0
Termonde,	Ghent,	28 September. 1837,	30,500,	18.9
Tirlemont,	Waremme,	2 April, 1838,	27,200,,	16.8
Waremme,	Ans,	2 April, 1838,	18,900,	11.7
Ghent,	Bruges,	12 August, 1838,	44,500,	27.6
Bruges,	Ostend,	28 August, 1838,	23,500,	14.6
		Total,	256,600,	159.0

According to the report, made by the minister to the house of representatives, on the 26 November 1838, the above ten sections, including buildings, locomotives and cars, cost 34,000,000 francs; this gives per mile of road 41,300 dollars. The rail-road from Brussels to Antwerp, 27.2 miles, has a double track; the remainder are constructed only with a single track, the rails weighing 45 lbs. per yard. But there are several buildings yet to be erected, and different works on the line to be executed, and besides a number of freight cars to be provided for, &c.; with all this the cost per mile will amount to 45,000 dollars.

II. *Tariff for Passengers, Speed.*

There are on the Belgian rail-roads four classes of passenger cars, differing only in elegance and comfort, but going in the same train, and therefore with equal velocity. The prices are:

In the Berlines,	2⅓ cents per mile,		For each passenger with 44 lbs. of baggage.
" Diligences,	2 " " "		
" Chars à Bancs	1⅓ " " "		
" Wagons,	0.8 " " "		

The trains perform at an average 17 Eng. miles per hour, all stoppages included, or from 20 to 25 while running.

III. *Traffic and revenue of the Belgian Rail-roads.*

The rail-roads in Belgium are frequented by more passengers than any other rail-roads; the transportation of freight was only begun between Brussels and Antwerp, in 1838. The following table shows the travel since the opening of the first section, until the 31st of October 1838.

Period.	Total number of passengers.	Average distance performed by each passenger.	Number of passengers reduced for one mile.	Gross Income. From all passengers.		per pas. per mile.
		Miles.		Francs.	Dollars.	Amer. cts.
From 5th of May 1835 to 2d of May 1836.	563,201	11.6	6,536,754	359,394	67,429	1.03
From 3rd of May to 31st of Dec. 1836.....	729,545	20.2	14,718,709	734,736	137,849	0.90
In the year 1837.....	1,384,577	17.2	23,838,436	1,416,983	265,850	1.11
From 1st of Jan. to 31st of Oct. 1838.....	1,921,619	22.8	43,887,864	2,589,384	485,813	1.11
In 3 years 6 months.....	4,598,942	19.35	88,981,763	5,100,497	956,941	1.07

To which must be added 44,148 francs, or 8,281 dollars, as the gross income from freight in the year 1838.

In the year 1837 there were 30,857 soldiers under the number of passengers, for whom, in consequence of an arrangement with the ministry of the war department, only half price was paid.

In 1838 the total number of pasengers amounted, according to the "Moniteur Belge," to 2,238,303, comprising 56,618 soldiers, and the gross income was 3,100,833 francs 40 centimes (581,770 dollars). As the average distance performed by each passenger in the first 10 months of 1838 is not mentioned in the report of the Minister, I supposed the income per passenger per mile to be the same as in 1837, out of which results an average distance of 22.8 miles. In order to show how the travelling public made use of the different classes of cars, the following contains the number of passengers in each class of cars, and the revenue resulting therefrom for the year ending 31st December 1838. During this period there were

		Classes.		
17,503	passengers,	I.	who paid	69,322f. 65c.
215,893	"	II.	"	702,502f. 70c.
604,935	"	III.	"	1,033,953f. 05c.
1,343,354	"	IV.	"	1,087,790f. 45c.
56,618	soldiers,		"	45,248f. 88c.
	For overweight of baggage, and freight,			162,015f. 67c.
2,238,303	passengers,		and total income,	3,100,833f. 40c.

These numbers explain sufficiently that the rail-roads in Belgium are used principally, by the lower classes of the people.

IV. *Cost of working the Belgian rail-roads.*

The accounts kept under this head contain an exact subdivision of the different expenses occurring in working the rail-roads; the first general subdivision contains *the maintenance of way and police;* the second *the cost of transportation*, viz. fuel, engineers and firemen, repairs of locomotives and cars, grease for the same, also the expenses for conductors, carriers and baggage men; the third embraces *the general expenses*, viz. clerks and ticket sellers, comptrollers, printing, advertising, office expenses, &c. The annexed table contains the expenses under the different heads:

Period.	Maintenance of way and police	Transportation account.	General expenses.	Total.	
	FRANCS.	FRANCS.	FRANCS.	FRANCS.	DOLLARS.
From 5th May to 31st Dec. 1835	...50,584 01..	..105,967 88..	...12,220 84...	..168,772 73..	31,665
Year 1636,.....	..132,637 41..	..261,778 30..	...36,719 96...	..431,135 67..	80,888
Year 1837,.....	..345,824 53..	..664,940 46..	..144,706 92...	1,155,471 91..	...216,786
From 1st Jan. to 31st Oct. 1838	..377.822 58..	1,059,180 71..	..182,186 48...	1,619,189 77..	...303,788
In 3 years and six months,....	..906,868 53.. or 27 pr. ct.	2,091,867 35.. or 62 pr. ct.	..375,834 20... or 11 pr. ct.	3,374,570 08.. or 100 pr. ct.	...633,127

As this table contains the expenses of working the rail-roads 3½ years, these numbers may certainly be regarded as the result of a great experience.

V. *Cost of Repairs of Locomotives and Cars.*

In the last table the sum of 1,059,180 francs 71 centimes appears under the head of transportation account for ten months in 1838. This sum contains the expenses for foremen in the shops, - - - - - - 32,177f. 54c.
For laborers, expenses - - 187,463f. 61c.
At the principal shops in Malines, 54.868f. 72c.
For materials for repairs,- - 87,965f. 66c.

Total, 362,475f. 53c.

or 68,006 dollars, which is 34 per cent. of the expenses of transportation. I believe that the expenses for repairs of engines and cars might be diminished by the introduction of locomotives with moveable trucks in front, and of eight-wheeled passenger and freight cars.

VI. Expenses Per Passenger Per Mile.

The accurate number of miles performed by passengers not being contained in the last report, the expenses per passenger per mile can only be found up to the end of 1837. According to the last statement, the expenses from the 5th. of May 1835, to the 31st. of December 1837, were:

For maintenance of way, - 529.045f. 95c.
Transportation account, - - 1,032,686f. 64c.
General expenses, - - - 193,647f. 72c.

Total, 1,755.380f. 31c.

During the same period the number of passengers reduced to 1 mile was equal to 45,093,899, which divided in the above gives as the expenses per passenger per mile,

	centimes,	or cents.
For maintenance of way, -	1.17	0.22
Transportation account, -	2.29	0.43
General expenses, - -	0.43	0.08
Total,	3.89	0.73

These expenses are very low, and are exceeded on every other rail-road.

VII. *Expenses per Mile of Travel.*

The number of miles performed by all the locomotives with their trains was:

From 5th May 1835, to 2d May 1836,	14,810 lieues.
From 3d May 1836, to 31st December 1836,	24,825 lieues.
From 1st January 1837, to 31st December 1837,	61,592 lieues.
Total,	101,227 lieues.

at 500 metres, or 314, 506 English miles; the expenses during the same period of 2 years and 8 months were,

For maintenance of way,	529,045f. 95c.	therefore per mile of travel,	1f. 68c. or 31½ cents.
For transportation account,	1,032,686f. 64c.	" " "	3f. 28c. or 61½ cents.
General expenses,	193,647f. 72c.	" " "	0f. 62c. or 12 cents.
Total,	1,755,380f. 31c.		5f. 58c. or 105 cents.

The expenses for every mile which a locomotive with its train runs, amount therefore to 5 francs 58 centimes, or 1 dollar 5 cents, being very near the same as on the American rail-roads.

VIII. *Number of Passengers per trip.*

In the table under No. 3, we have shown that the number of passengers from the 5th of May 1835, to the 31st of December 1837, reduced for the length of a single mile of road, amount to 45,093,899; during the same period the trains performed 314,506 miles; this gives 143 as the average number of passengers in a train. This number compared with 5f. 58c. as the expenses per mile of travel, gives again 3·89c. or 0.73 cents as the expense per passenger per mile.

IX. *Comparison between the gross income and the nett revenue.*

The following table contains the annual gross income, current expenses and the surplus of income over the expenses, as is related in the report of the Minister of the 26th of November 1838, to which is annexed the annual surplus for every 100 francs of the gross income.

Period.	*Total gross Income.* FRANCS.	CENT.	*Current Expenses.* FRANCS.	CENT.	*Surplus of the revenue over the expenses.* FRANCS.	CENT.	*From 100f. of the gross income remained after defraying all expenses.*
5th May 1835, to 31st Dec. 1835,	268,997	50	168,772	73	100,224	77	37f. 26 centimes.
Year 1836,	825,132	85	431,135	67	393,997	18	47f. 75 centimes.
Year 1837,	1,416,982	94	1,155,471	91	261,511	03	18f. 46 centimes.
1st Jan. 1838, to 31st Dec. 1838,	2,633,532	21	1,619,189	77	1,014,342	44	38f. 52 centimes.
Total,	5,144,645	50	3,374,570	08	1,770,075	42	34f. 41 centimes.

As an average, therefore, of 3½ years, of every 100 francs revenue, only 34 francs 41 centimes remained, but as all the locomotives and cars are still new, and no amount for general depreciation appears under the expenses, it is to be supposed, that in future only 30 francs will remain from 100. This surplus serves as interest and a sinking fund for the capital.

X. *Gross income per mile of rail-road.*

The public in Europe is almost throughout of opinion, that only short lines, and these especially between two populous cities, will pay a good interest, but the branch roads extending to remote, less populated parts of a country will never yield any profits. What results the Belgian roads give in that respect, the annexed table will show:

Period.	*No of sections opened.*	*Average length of road in operation.*	*Gross income during the whole period.* FRANCS.	CENT.	*Annual income per single mile of road.* FRANCS.	CENT.	DOLLARS.
5th May to 31st Dec. 1335,	1	12.6	268,997	50	32,333	75	6,066
Year 1836,	2	22.3	852,132	85	38,212	23	7,169
Year 1837,	6	56.1	1,416,982	94	25,258	16	4739
1st Jan. to 31st Oct. 1838,	10	118.7	2,633,532	21	26,638	34	4,998
Total,		53.1	5,144,645	50	27,735	98	5,204

In the second column appears for the year 1835, only the section between Brussels and Malines of 12.6 miles, opened at that time. In the year 1836, these 12.6 miles were in operation for 365 days, and the second section from Malines to Antwerp, of 14.6 miles, for 243 days only. In multiplying the length of each sections by the respective numbers of days, and dividing the sum by 365, we receive 22.3 miles as the average length in operation during the whole year 1836. In the same manner the average length was obtained for the years 1837 and 1838. The last column shows, that the annual receipt per single mile of road amounted in the first year, when the novelty attracted many passengers, and only 12.6 miles were opened, to 32,333 francs 75 centimes, and that in the 3d and 4th year, when curiosity attracted but few, and the greatest number travelled for business only, and while a much greater length of road was in operation, these receipts amounted still to 26,500 francs per mile yearly. This amount will undoubtedly be increased in the following years, as in 1838 four new sections came in operation, on which the traffic will develope itself only by-and-by; besides there will be the transportation of goods, which for the year 1839, is estimated to give a revenue of 850,000 francs for 159 miles, or 5346 francs per mile; the gross income on the Belgian rail-roads, will therefore also in future, like the first year, amount to about

32,000 francs per mile of road annually. That by the increase of population and commerce, also this income of 32,000 francs will be increased, is evident; the rail-roads in Belgium serve therefore as a proof, that long lines of rail-roads may (some extraordinary circumstances excepted,) be executed with equal success as short ones.

It would be quite erroneous in calculating the revenue of a system of rail-roads, canals, or turnpike roads, to regard the income on the principal line separately, and so the revenue of each of the branch lines, in order to judge of the value of each of them. By the opening of a branch line, the income of the main line must become greater; because the passengers and freight from the branch lines will pass over the same and increase the revenue. The accurate way of culculating a whole system of rail-roads, canals or turnpike roads, must therefore be to compare the *total income of the main line as well as of the branch lines*, with the *total length of all the lines*, in order to find the *average income per mile*; and in deducting therefrom the expenses, the balance will show, when compared with the cost of construction per mile, what interest enures for the capital invested.

XI. *Budget for the operations of the Belgian rail-roads in the year* 1839.

We have seen that the annual gross income will amount to 32,000 francs per mile, therefore for the 159 miles, which are in operation, to 5,088,000 francs. After defraying all the expenses from 100 francs gross receipts there remain 34 francs 41 centimes, the net income will, therefore, be 1,650, 780 francs, instead of which the minister in his budget anticipates the amount at 1,700,000, to which he is led by a different calculation. This surplus is exactly 5 per cent. of the capital expended of 34,-000,000 francs. These 5 per cent. suffice for interest and sinking fund, and therefore the Belgian rail-roads fulfil their object, to maintain themselves without being a charge to the state treasury.

XII. *Increase of income from the mail and turnpikes.*

As an objection against rail-roads it was further maintained, that their introduction in a country will lessen considerably the receipts of tolls on turnpike roads and of the mail, because there will be less travel on turnpike roads, and letters will be carried by persons who travel on rail-roads; the same opinion appears to have existed in Belgium. On the 27th of January 1838, the minister, Mr. Nothomb, declared in the senate, that the revenue of the mail in 1837, exceeded that of 1836 by 262,373 francs, and the tolls on turnpike roads by 110,000 francs, for the reason that although the tolls on those roads which go in a parallel direction with rail-roads are lessened, yet they are increased in a greater proportion on those turnpike roads which lead to the rail-roads, as they are passed over by all who come to travel on the latter. The revenue from the mail increased in consequence of the greater intercourse occasioned by the introduction of rail-roads.

XIII. *Camparison of the Belgian Rail-Roads with those in the United States.*

According to table under No. 3, the number of passengers during 3½ years, reduced for the length of one mile, amounted, on the Belgian rail-roads to 88,981,763, or at an average per year of 25,-423,361. As the average length of road in operation during the whole time was 53.1 miles, we have 478,783 through passengers annually. The *Belgian rail-roads are therefore travelled over on their whole length by nearly* 500,000 *passengers per year.* We have now the following comparison:

(a) Cost of construction.—A mile of rail-road with a single track, and the necessary building and outfit, costs in America 20,000 dollars; in Belgium 41,300 dollars, or more than twice the amount.

(b.) Tariff.—On the American rail-roads, a passenger pays at an average 5 cents per mile; on the Belgian rail-roads, only 1 cent, or five times less; for freight, the charge is, in America, at an average 7½ cents per ton per mile.

(c.) Speed.—On the American rail-roads, passengers are conveyed with a speed of from 12 to 15 miles per hour, stoppages included; on the Belgian roads at the rate of 17 miles; or stoppages not included, at the rate of from 20 to 25 miles.

(d.) There are at an average, 35,000 through passengers, and 15,000 tons of goods carried annually over the American roads; on the Belgian there have been carried per year 478,783 through passengers, and the trasportation of goods only commenced a short time since.

(e.) Gross income.—The same amounts on the American rail-roads, at an average per mile and per year,

From 35,000 passengers at 5 cents, -	$1750
From 15,000 tons of goods at 7½ cents,	1125
From mail and contingencies, - -	200
Total,	$3075

On the Belgian rail-roads the gross income per mile from 478,783 passengers, and the trasportation of freight amounts to 32,000 francs or 6003 dollars 75 cents per year.

(f.) Expenses per mile of travel.—These amount on the American rail-roads to 1 dollar, on the Belgian roads to 1 dollar 5 cents, or they are the same in both countries.

(g.) Number of passengers per trip.—In Belgium there were in each train, at an everage of 3½ years, 143 through passengers; on the American roads, a passenger train contains only 40 through passengers, at an average.

(h.) Number of trips per year.—In dividing 85,000 by 40 we obtain 875, as the average number of passenger trips per year on the American rail-roads; and in dividing 478,783 by 143 we get 3348, which represents the average number of passenger trains passing annually over the Belgian roads. As at the same time the speed on the latter is greater than on the American rail-roads, it was necessry to employ rails of 45 lbs. per yard while their weight is generally less on the American rail-roads.

(i.) Expenses per passenger per mile.—These are in Belgium only 0,73 cents, and in America 2½ cents, or 3½ times more. The reason of it is, that the American trains contain 3½ times less passengers, while the expenses per train per mile are equal in both countries. It is very nearly the same for a locomotive to carry 40 or 143 passengers in a train.

(k.) Annual current expenses.—In America the annual current expenses for working a rail-road, are per mile,

For transportation of 35,000 passengers, at 2½ cents, - - - - - 875 dollars.
For transportation of 15,000 tons of goods at 6½ cents. - - - - - 975 dollars.
For transportation of the mail and other expenses. - - - - - 100 dollars.

Total, 1950 dollars.

Or 63 dollars 41 cents of every 100 dollars gross income. On the Belgian rail-roads, of every 100 dollars gross revenue, the expenses are 65 dollars 59 cents, or per year per mile 3937 dollars 86 cents.

(l) Interest on the capital invested.—In America the annual average gross income, per mile, of road, amounts to 3075 dollars, the annual current expenses to 1950, leaving 1125 dollars, which compared with the cost of a mile of road (20,000 dollars), give 5½ per cent, interest. On the rail-roads in Belgium, the annual gross income, per mile, is 6003 dollars 75 cents, the expenses 3937 dollars 86 cents, leaving 2065 dollars 89 cents as interest on the cost of 41,300 dollars per mile, or exactly 5 per cent.

XIV. *General remarks.*

The comparison of the results of the Belgian rail-roads with those of the rail-roads in the United States of America, speaks evidently in favor of the first. The extremely low charges for passage on the Belgian rail-roads has increased the number of passengers in an unparalleled degree, and produced an intercourse not attained in any other country of the world. While the higher prices in the better classes of cars yield a considerable profit, the price in the last class or for the great mass of the people, is so low that it almost only covers the expenses. The Belgian rail-roads are, therefore, throughout a great popular, democratic establishment, which must have found the approbation of the people and every intelligent man; the Belgian rail-roads afford to the government the greatest facility in the tranportation of troops, the importance of which was evinced principally for the last years; the Belgian rail-roads yield, in conformity with the grand idea of their establishment, only the interest and sinking fund of their capital, but the state treasury has, by the increase of intercourse, indirectly gained in all taxes, in the revenue from tolls on turnpike roads and from the mails; the most important gain, however, was that kept in view by the great founder of these roads, to bring the nation into a more intimate contact, and to form of it one large family, on which the actual national device, "L'Union fait la force," ("Union gives strength,") becomes realized.

F. A. Chevalier De Gerstner.

Cincinnati, 25th June, 1839.

☞ Five francs and 33 centimes, or 533 French centimes are equal to one dollar. One English mile is equal to 1610 me'tres.

THE COTTON CROPS OF THE WORLD.

From the Philadelphia Inquirer.

There is no subject connected with commerce or agriculture, which possesses a higher interest for the citizens of the United Siates, than the production and consumption of cotton. We have, on more than one occasion, devoted our columns to the insertion of informatron upon the subject; and our attention is particularly called to it just now, in consequence of a recent publication of a valuable letter, signed "Cotton Plant," in a spirited New York paper, called the 'Whip.' The writer commences by stating that the entire growth of cotton in the world is set down at $1,000,000,000 pounds. Of this, 550 millions are supposed to be grown in the United States; 30 in Brazil; 8 in the West Indies; 27 in Egypt; 36 in the west of Africa; 190 in the west of Asia; 35 in Mexico and South America, except Brazil; and 14 millions elsewhere.

Thus, at 10 cents per pound, a price below which it has rarely ever fallen, this crop is worth $100,000,000. For the last fifty years, however, the value (though often fluctuating suddenly and widely) has averaged 19 1-2. At this price, the present growth of the world is worth $192,500,000.

Of this, about 350 millions of pounds are consumed and manufactured in England; about 150 millions in the United States; 80 in France; 250 in China and India; 25 in South America and Mexico, including Brazil; 35 in Germany; 45 in Turkey and Africa; 10 in Spain; 20 in Russia; and the remainder elsewhere.

The value of cotton manufactures in England is believed to be annually about 170 millions of dollars; in France at 70 millions; in the United States at 60 millions.

The capital employed in manufacturing by machinery, is estimated in England at 200 millions of dollars; in France at 120 millions; in the U. States at 110 millions.

The consumption in manufactures of raw cotton in all Europe, in 1803, was estimated at only 60 millions of pounds. (Dic. of Span. Com.) The whole consumption in Europe, in 1830, was about 387 millions of pounds, In 1838, it is believed to be nearly 500 millions of pounds.

South Carolina and Georgia were the first states in this Union to grow cotton to any considerable extent. In 1791, two millions of pounds were grown in the union—one and a half millions of which grew in South Carolina, and one half million in Georgia.

In 1801, forty millions was the crop of the United States—of which, 20 millions grew in South Carolina, 10 in Georgia, 5 in Virginia, 4 in North Carolina, and 1 in Tennessee.

In 1811, the crop of the United States had reached 80,000,000—of which, 40 grew in South Carolina, 20 in Georgia, 8 in Virginia, 7 in North Carolina, 3 in Tennessee, and 2 in Louisiana.

In 1821, one hundred and seventy millions of pounds were growing in the union, as follows: 50 millions in South Carolina, 45 in Georgia, 20 in Tennessee, 20 in Alabama, 12 in Virginia, 10 in North Carolina, 10 in Louisiana, and 10 in Mississippi.

In 1828, the whole crop of the union was 348½ millions. Of this, Georgia grew 75 millions, South Carolina 70, Tennessee 45, Alabama 45, Louisiana 38, Mississippi 20, Virginia 25, North Carolina 18, Florida 2, and Arkansas one-half of a million.

In 1833, the crop of the union had increased to 437¾ millions. Of this, 88 millions grew in Georgia, 73 in South Carolina, 70 in Mississippi, 65 in

Alabama, 55 in Louisiana, 50 in Tennessee, 15 in Florida, 13 in Virginia, 10 in North Carolina, and three-fourths of a million in Arkansas.

The next year (1834) the crop had increased to 457 1-2 millions, and was grown as follows; 85 in Mississippi, 85 in Alabama, 75 in Georgia, 65 1-2 in South Carolina, 62 in Louisiana, 45 in Tennessee, 20 in Florida, 18 in Virginia, 9 1-2 in North Carolina, and in Arkansas one-half a million. Subsequently, no certain data are in our possession; but the estimate at this time, is 550 millions as the whole crop of the Uuion.

Thus it will be seen, from 1791 to 1826, South Carolina was the most abundant cotton growing state in the union. In 1826, Georgia took the lead, and held it till 1834, when Alabama and Mississippi took the front rank. At this time, Mississippi is perhaps the most extensive cotton growing state in the union. South Carolina and Alabama are next. North Alabama is begining to deteriorate as a cotton country, while the worn lands in middle Tennessee are thought to improve for this culture—maturity, the vital desideratum, not being so easily allowed in the rank luxuriance of the fresher soils.

When it is remembered that the *first cotton plant in the United States* were raised in 1787, surely our readers will find reason for surprise at the wonderful increase that has accrued in little more than fifty years! Bold, indeed, must be the man who would venture to predict the wealth, greatness, and power, likely to become our national attributes through the agency of cotton.

NEGLECT OF AGRICULTURE IN GUILFIELD, N. C. RECENT DISCOVERY OF LIME.

Guilfield, N. C., Dec. 28th, 1838.

* * * * * * * *

We have great need of information on agricultural subjects in this part of the country. The county of Guilford has a population of 20,000 souls, and I do not know of but two other gentlemen in the county, besides myself, who take an agricultural newspaper. There may be others of whom I do not know, but it is certain, the number is but small. This county in regard to original fertility, has been one of the finest in the western part of the state. The county lies on the head branches of the Cape Fear, one large branch of which, the Haw, runs across it on the north side, and Deep River on the south, which together with the numerous tributary streams emptying into them, have afforded in times past large bodies of beautiful lands for cultivation; but the hand of man has been too successful in its destruction. Here we have no judicious rotation of crops; but one year in corn and the next in small grain; and this in continual succession has been, with few exceptions, the general system of cultivation. But little attention has been bestowed on making manures, and no matter what may be the demand and the need for that commodity, the supply usually consists of what is made in the stables in a natural way, perhaps even without a necessary supply of litter.

Lime has heretofore been beyond our reach and beyond our hopes. But from the accidental burning of the soil of a neighboring county (Stokes) in the course of the last year, we now entertain the belief that it may ultimately be furnished in such quantities and for such prices as will justify its application as a manure for lands. The soil was underlaid with a species of rock that no person had ever dreamt of being lime-stone; but the first rain that fell after the fire, the rock slacked and furnished a quantity of fine lime. The quarries from which the rock were obtained are about thirty miles west of this place, and are said to be inexhaustible.

I think I can perceive the commencement of a better and more enlightened system of agriculture than we have heretofore had. Improvements have already begun, and I have no doubt will be successfully carried on. There seems to be a desire for agricultural information pervading the country, which I hope will be the means of causing the people to procure and read agricultural papers. Industry is not wanting. And I have no doubt when knowledge and information are added to the industry which our people possess, that it will be the means of making our country, what it ought to be, prosperous, wealthy and happy.

[The foregoing extract was marked for publication, at the time when rececceived, but by accident the letter containing it was mislaid, and was not recovered until now.—Ed.]

HUSSEY'S REAPING MACHINE. ILL EFFECTS TO DESERVING INVENTORS OF THE PUFFING SYSTEM.

As far back as in our second volume (at page 593,) we published an account of the operation of Hussey's reaping machine, which then was receiving favorable notice in the papers of the day. But, like nineteen-twentieths of what are called agricultural improvements, after so much early eulogium, it seemed to pass into oblivion, and we heard nothing more of it for some years, and naturally inferred that it was like so many other novelties (or supposed novelties) which are continually sent forth, under a cloud of bought and begged and false commendation, and which after effecting as much as possible their object, to deceive for gain, had sunk into merited contempt. But this machine has recently been again brought to public notice, and in such manner as to induce the belief that it is likely to be a very valuable agricultural improvement. In addition to several newspaper articles, one of which will be copied below, we have the following statement, in a short postscript to a private letter from S. Hambleton, esq., of Talbot, Md., from whom we shall be pleased to receive a much more full and particular account, for our next number.

"I am running, with much satisfaction, Hussey's wheat reaper. It works well and with expedition. Two horses, one driver and a raker attend it. It keeps eight binders pretty well employed."

The following notice is from the American Farmer.

"We learn from the Bugle at Chestertown, that this machine was put in operation on the farm of Judge Chambers near that place, and that it far surpassed the expectations of all who witnessed it. Judge Chambers has about 150 acres in wheat and rye, and the manner in which the fields so far have been cut down is much superior to the ordinary mode of cradling, scarcely a straw being left standing. The machine keeps 6 binders hard at work, even with the stoppages that are incidentally required; we suppose it could give employment to several more, without increasing the speed, which, says the editor, when we saw it, was a brisk walk, three mules being hitched to it. This machine we understand is warranted to cut 15 acres per day; at that rate, it is more than equal to six cradlers. Another thing which attracted notice was the great regularity with which the straw and grain were laid for the binders, no raking with careful binders being required. Every person who has seen this machine in operation has been highly gratified with its performance—among others, Judge T. B. Dorsey of Anne Arundel and John Glenn, Esq. of Baltimore, who came over last week in the steam-boat Walcott for the express purpose of witnessing its operation. It is as much superior in the quantity and quality of its work to the cradle, as the latter is to the old fashioned reaping hook, and it answers equally well in light grain or rank.

The American says—"The patent reaping machine of Mr. Hussey has been used in various parts of Maryland during the recent harvest, and has been very generally and highly approved, as well on account of the perfect and expeditious manner in which it operates, as the saving of labor effected by it. Opinions are various as to the amount of work which it performs in a day, some estimating it as equivalent to six, and others to ten cradles. The cost of the machine is $150."

If this machine should prove to be, as we earnestly hope it may, a very important benefit to agriculture, the facts of its early and general commendation, and afterwards, its long neglect, and now its resuscitation and testing by fair and proper trial, all go to show the great injury inflicted on deserving inventors themselves, as well as on the gulled public, by the *puffing system*, which is in such universal use in this country. Every new invention or scheme, or publication, whatever may be its degree of merit or demerit, is ushered forth with puffs upon puffs. Dupes are made, and the knaves, who puff and sell, profit at the expense of the fools who believe and buy. And the more discreet or cautious, who know the working of the puffing system, stand aloof, and trust as little to true statements as to the false; and the most excellent and meritorious discovery consequently suffers the neglect, and its trial and introduction are opposed by the incredulity, with which the same class would treat the "Chinese tree-corn;" and they view the discoverer with suspicion, and deem him as little worthy of truth, as the noted introducer of that humbug, and of the notable plan of making dupes *for the sake of charity*. By the way—the extensive sale of "Chinese corn" at 25 cents and $1 the ear, must have made the charity fund of considerable amount; and it is time that Mr. Thorburn should publish his report of the charitable purposes to which this great harvest of profit was to have been appropriated, according to his promise. It is said that this small stock of miraculous corn has proved to be as inexhaustible as the widow's cruise of oil; and it may be safely admitted that, whether it deserves, or not, the seller's recommendation for extraordinary productiveness, *while growing*, that no corn, before known, ever grew so fast in quantity *after it had been gathered and offered for sale*.

QUERIES ON CHINCH-BUG AND OAT-LAY.

To the Editor of the Farmers' Register.

Nansemond Co., July 14th, 1839.

Will you, or some of your many contributors, have the extreme kindness to inform a subscriber, what course to pursue to rid himself of the chinch-bug? My crop is quite much infested with them, and I fear will be seriously injured; they (the chinch-bugs) having been introduced on my farm I suspect by some seed wheat which I purchased of a neighbor. Also the most speedy and economical mode of resuscitating land which has been over-dosed with marl; the idea has suggested itself to me that by turning in a green crop of oats would be beneficial.

What think you of an oat-lay as an improving crop? the seed cost much less than any thing else which we could seed the land in; but the objections to it would be, that they would have to be turned in during a very busy season, and the land would be exposed to the sun until covered by a crop of weeds; which might not be speedily on poor land.

Any information on the above subjects, would much oblige your constant reader H.

WITCH GRASS*

Mr. Editor.—Some of your correspondents have been striving to rid themselves and their neighbors of that troublesome weed, witch grass. Now I happen to know from experience one of the easiest and most profitable methods of destroying this grass. This grass will never increase in pastures. It always finds its way into such land as has a warm light soil and is most cultivated. Land abounding in this weed should be immediately converted to a sheep pasture, and in a few years it will be entirely eradicated.

My father once took a piece which was thickly set with it, ploughed it late in June, sowed it with winter rye and turned it into his sheep pasture.

* We believe that this is the New England name for what is called wire grass in Virginia, and couch grass in England.—Ed. F. R.

The rye continued to come up for a year or two and was kept closely fed by the sheep, and in a few years the witch grass was exchanged for sweet clover and red-top. I doubt not but that this plan might be adopted to advantage on many farms that are overrun with this useless weed. It is folly to talk of digging it up when it has obtained a firm foothold. Land that is of a light thin soil can be changed from tillage to pasturing to great advantage. Pastures would be improved in this way, for it is bad economy to possess a pasture that will give only now and then a spot that cattle will touch.

Another method I have seen practised in ridding small garden spots of this grass, which is by laying boards closely over the ground for a season. This is much easier than to dig it up. While on this point I cannot help noticing one fault among gardeners. They are very anxious to prevent the weeds from going to seed during the first part of the season, but as soon as the plants get a little start, they suffer the weeds to take their own course. Consequently there is a fresh supply of seed for the succeeding spring.

If some of your correspondents will counsel me in killing thistles with as little labor and as much profit, as I have advised them in killing witch grass, they will receive my sincere thanks.

AGRICOLA.

REMARKS IN REGARD TO THE MANUFACTURE OF SALT, BY SOLAR EVAPORATION, WITH COVERED WORKS.

As contained in a pamphlet, submitted to the first subscribers to the La Fayette Salt Company.

It has been ascertained from the most anthentic and respectable sources, that the net profit arising from the manufacture of salt, by solar evaporation, from sea water, at Cape Cod, in Massachusetts, in the latitude of about 42 deg. north, has not been less, for many years past, than 15 per cent per annum, upon the amount of capital invested, notwithstanding the reduction of the duty upon the imported article; and in some very favorable seasons, from 18 to 20 per cent has been realized. This profit is the result of about four month's favorable weather; for, though the works are in operation seven months in a year, yet the evaporation in the spring and fall is so slow, that little is gained by it. The sea water made use of, contains about three per cent of salt, and is thrown at once into wooden pans, without being strengthened from exposure to the rays of the sun in natural reservoirs.

The Island of Key West is situated in the latitude of 24° 25′ N, which differs but little from the latitude of the Bahama Islands; and its climate and vegetable productions are similar. Its salt pond, which measures 340 acres, offers a greater extent of surface than any of the Bahama salt ponds, with the exception of that at Rum Key.

It is estimated that the evaporation in the latitude of Key West is at least *double* that which is found to exist in Massachusetts;—and salt can be made every day in the year, if the fact stated by the northern manufacturers as undeniable, affords any criterion whereby to judge, viz:—that salt will make with them, with the temperature of the weather at 48 deg. of Fahranheit. At Key West, the annual average of the temperature is 76 degrees, and the thermometer has only once, since the settlement of the island, indicated so low a temperature as 48 degrees. It is confidently believed that the winter months at Key West are quite as favorable for evaporation as the summer months in Massachusetts.*

The sea water at Key West, is believed, from experiments made, to contain a greater percentage of salt, than at Cape Cod; the water, however, which would be appropriated to the purposes of salt making with covered works, will be obtained from the natural pond, which, on an average throughout the year, is at least ten per cent stronger than sea water, and has been known, in very dry seasons, to reach the point of saturation, and, in many parts of it, to deposite large quantities of salt. Sub-reservoirs may be constructed upon the margins of the pond, of any convenient size required, at a trifling expense, in which the evaporation would be three or four times as great as in the large pond, inasmuch as the depth of water in these reservoirs could be regulated at pleasure.†

The great expense attending the manufacture of salt in Massachusetts, is the necessity which exists for reservoirs and pans to bring the water to the point of saturation. Nine out of every ten pans are employed for this purpose, consequently, could they obtain water or brine at the point of saturation, with which to fill their pans in the first instance, their production, and consequently their profit, would be just ten times what it is at present, from the same investment of capital; and in the same proportion for any intermediate strength at which they may first obtain their water. Hence is seen, at once, the great benefit which manufacturers of salt at Key West will derive, from possessing a natural reservoir of water, so considerably increased in strength.

The rate at which salt is sold in the United States, admits of the construction of expensive works for its production; while its abundance and cheapness in the Bahama Islands is such that it can be advantageously introduced into this country, notwithstanding the protecting duty of 10 cents on 56 lbs, making from 13 to 14 cents on the measured

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* Should also have given the number of *fair* and *windy* days which, however, can be seen in the metereological registers kept the last six years. H. P.

† Both reservoirs and sub-reservoirs can be constructed in the open sea on the north side of the islands from Matacumba to the north-east extremity of Key Larga, as they are protected from the force of the waves by the shallowness of the waters between them and the main coast from Cape Table to Cape Florida. From the north sides of these islands extend level flats of thousands of acres of stiff marl which are *entirely bare at low water*, *i. e.* six to twelve inches above low tide; and the greatest extremes of tides here do not exceed 3½ feet between the highest spring and lowest neap tide, while the average rise and fall is but three feet. Hence all that would be requisite to form reservoirs would be simple ditching and embankment of the marl four feet high!! What a field for the employment of the ditching and embanking machine!! Now that Indian hostilities have ceased, it is to be hoped that many invalids and capitalists will spend next winter in cruising among these Keys to judge themselves of the profits to be made either in salt manufacture or *textile* agriculture, among these hitherto despised and calumniated islands!

bushel. In so bulky an article as salt, it is at all times important, that its transportation should be attended with the least possible expense;‡ in this particular, few places possess the advantages of Key West. It offers a safe harbor, of easy access, before which vessels are constantly passing in ballast, on their way to and from the ports in the Gulf of Mexico, and in the harbor, ships of the largest class can receive the salt from boats, which can carry it direct to them from the pond, which is less than two miles distant.

As an evidence that evaporation goes on more rapidly as you approximate the equator, Newman Kershaw, Esq. erected a small set of covered works a short time since at Morris' Island, South Carolina, which is in latitude 32° 40′, where, from sea water, and without the aid of a natural reservoir, he makes from 30 to 33 per cent per annum, upon the capital invested.

As an additional proof of which, see the following extract of a letter, from a highly respectable gentleman residing at Turk's Island, which is in latitude 21° 30′ N. addressed to Mr. John Whitehead.

"I notice by a Key West Register of the 5th of March, (which recently fell into my hands) that you have already been put in possession of some information on the subject of making salt by solar evaporation:—you ask me to state the cost of a pan covering a surface of 10,000 superficial feet:—This, as well as every thing else, you are aware, would depend upon the comparative value of labor, &c. Here, for instance, such a pan would not cost more than $50, and would yield from 1500 to 2500 bushels at a raking. We do not calculate upon more than three rakings in a season, (which is from 60 to 90 days) though five are some times got:—1500 bushels is a fair average for each laborer; it does sometimes, however, amount to as much as 3000 bushels."

From the foregoing data, no hesitation can be felt in adopting the opinion that the manufacture of salt at Key West, offers inducements for the investment of capital, which no other business can present.

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Extract from the Report of the Salt Company.

The "Salt Pond," so called, is a low, flat surface, in the interior of the island, near the north east end, based on limestone, which is covered with a white tenacious marl, impervious to water. It is about on a level with low tide, and so flat, that six inches of water will flow the whole three hundred and forty acres. Formerly, spring tides flowed over into this pond in two different places, and filled it. This water having no outlet, evaporation, and in dry seasons, formed salt in the whole pond without any artificial aid. Now, besides preventing the influx of spring tides, the company have cut a canal through the rock ten feet wide, by which they can either admit or discharge the water at pleasure, and thus hold a perfect control over it.

The company commenced operations in the autumn of 1834, attempting, for the first time to combine the Bahama and New Bedford plans of salt making in the same scheme, and began to granulate salt in the fall of 1835. Not being able to obtain information applicable to this combined mode from any source, they necessarily lost much time and expense. But they instituted a series of experiments, and the result is, the purest and heaviest salt known, from which the bitter water is thoroughly washed, so that it will not "give," or become damp in wet weather.

Heretofore, the company have used but about five acres of pond surface in connexion with two strings of covered works, containing about 5,300 salt work feet built after the New Bedford plan, and have granulated salt in little less than one-third of this covered surface. The yield has been one and six-tenths bushels to the foot of covered surface throughout, or 8,500 bushels per annum. They have now taken in about sixty acres of pond surface, and have made such purmanent improvements, as to render this, also, tributary to their covered works, and such additions as may be made hereafter to them. An expense in labor of about three hundred dollars, will add a hundred acres of pond surface more, whenever it may be needed. And a small amount of labor, not exceeding one hundred dollars, will convert the pond or lake of about 180 acres surface, laying to the northeast of the main pond, into an evaporating surface. From this pond or lake the main salt pond is to be fed, by two canals, not exceeding 17 rods in length.

The object of requiring so much evaporation surface is, in the dry season (from December to the last of May,) to bring the water to the point of saturation in the pond reservoirs, and in that state to fill the covered works throughout, and thus make all of them granulating surface, instead of less than one-third, as heretofore. If but *one* raking of salt can thus be obtained per annum, of which the directors entertain no doubt, the yield will be more than doubled—that is, more than three bushels of salt will be made to each foot of covered works. In very favorable years, two such rakings may be thus obtained, with the aid of a covered reservoir, which would swell the yield to an enormous amount.

Three rakings have been made per annum in about one-third of the covered works, by drying down the works full of water three times to each raking; thus about sixty inches of water at the point of saturation is converted into salt. This result is liable to be increased or diminished, as the seasons prove more or less favorable.

The company employ three hands and one overseer, who are amply sufficient to tend six strings of works instead of two: As all the necessary fixed or unproductive capital is now invested, the pond improvements made, and the necessary knowledge acquired, every dollar of additional capital hereafter subscribed, will be devoted to covered works, which promise advantages to the capitalists, not to be looked for in a new company not as far advanced as this.

The fixed or unproductive capital invested by this company, exclusive of real estate, is estimated at $12,000. The works for the last six months,

‡ Every island on the coast presents this advantage. The salt from the works at Key West has to be first put into lighters to be transported aboard the vessels in the deep water of the harbor, a mile or two distant. And at all places, the reservoirs must necessarily be near a shallow shore. H. P.

have made over 10 per cent per annum on the whole investment, and will still become more productive, by the daily improvements going on, even if the works should not be further extended.

Shares are $100 each;—and there have been paid in 184 cash shares. The works may be advantageously increased, from one hundred to one hundred and fifty shares per annum, until the whole amount needed is taken up.

For statements showing the range of the thermometer and quantity of rain, for a series of years at Key West, see American Almanac for 1838.*

F. A. BROWNE, *Pres't.*
A. GORDON, *Secr'y.*

INFLUENCE OF THE STOCK ON THE GRAFT. AN ERROR CORRECTED.

From the Farmers' Cabinet.

Sir,—In my paper on this subject inserted in Cabinet, No. 10, page 311, I state in favor of the position (argument 10) that I had read in some British publication, of "the orange grafted upon the pomegranate at Malta, giving fruit which was red inside." This supposed fact was repeated to me ten years since by a commercial friend who had resided at Malta for some time, and I stated it to Mr. Loudon, of London, editor and author of many useful publications on agriculture and horticulture, who declared the circumstance impossible, by reason of the two trees being of different genera.† As I deemed it important to ascertain the truth on the subject, I requested Mr. Winthrop Andrews, Consul of the United States at Malta, to inquire into the subject, and I am pleased to state that he has been enabled to dispel all doubt on it, by a communication dated July 12, 1838, from Professor Terafa, of the University of Malta, and author of some works on botany. This gentleman, after noticing the general prevalence of the error in question, says "our blood or red-colored orange is nothing more than a species of our common orange, as botanically called 'citrus aurantium,' derived from a tree accidentally planted in earth abounding in oxyde of iron, which, in a part of the island is not uncommon, and the same being afterwards propagated by grafting, served to preserve the variety of the species, while it has not the power to change its nature."

The general prevalance of the error may be known from a fact mentioned to me by Mr. Andrews, "that in three publications which recently came under his observation, two in Italian and one in English, the authors have entertained the same opinion on the subject in question, the origin of which is now satisfactorily explained.

The weight which I wished to attach to the supposed botanical anomaly (in argument 10) must now be given up, but I think enough more are adduced of undoubted authority to prove the influence of the stock on the graft, and its fruit.

It was Brydone of England, in his very pleasant book of "Travels through Sicily and Malta," published so long since as the year 1771, that first gave currency to the vulgar belief of the Maltese of the red flesh of the orange being the result of that tree being ingrafted on the pomegranate stock; but it is very probable that, with the majority of mankind, who cannot see the refutation of the error, it will maintain its ground, like the prevalent one in the United States, respecting the flowering of the American aloes only once in an hundred years.

JAMES MEASE.

May 25, 1839.

AN ECONOMICAL BOILER.

To the Editor of the Farmers' Register.

St. Stephens Hill, Fauquier,
May, 1839.

In the 12th number of the 6th volume of your valuable Register, there is an account of "cooking grain for stock," taken from the 'Farmers' Cabinet.' To persons of any reflection or experience, the value of cooking grain for fattening cattle and hogs, feeding milch cows and farm cattle and stock, must be evident. The apparent trouble, delays and expense, of employing machinery generally, deters the unthinking from trying the methods pursued in those countries where the value of time, labor, and fuel is best, and I may say, in comparison with the southern states, only known.

The amount of white and slave labor which was transferred from this state from the year 1833 to '38 inclusive, was immense; and for the same space there was a great decline in the products of agriculture, and the income of the farmers. We made, compared with former times, no crops for market during that period; yet, the value of labor has risen from 75 to 100 per cent. This is to be accounted for in the diminished number of laborers. Such being the fact, there is, then, not only a motive, the result of new notions of economy arising from the general condition of the country, but a necessity for adopting such plans, in our agricultural and household management, as will save time, labor, fuel and food. Superadded to these and other causes of the immediate decline of the profits and great interests connected with the cultivation of the earth, are the multiplied demands upon our incomes for the support of the ever-varying fashions of the day, and the high prices of all articles, whether of necessity, comfort, taste or luxury.

Thus circumstanced, what does prudence suggest to the farmers of Virginia? There can be but one reply. We must adopt a system of improved economy, in the use of time, labor and capital. The cooking of grain for stock constitutes an important item in this system. The preparation of food by cooking is a matter of greater consequence

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* *Note by H. P.*—As good if not better facilities for making salt exist at numerous Keys, the whole distance from Cape Florida to the Tortugus. In this business, with few laborers, capitalists could profitably invest from ten to twenty millions of dollars; for so long as the evaporation of sea water can be carried on at all in the United States north of 28° of latitude, it must yield at least 100 per cent. more in the latitudes of the Florida Reef; and hence the *cultivation* of these Keys will receive an additional stimulus. It is only with reference to its indirect promotion of agriculture that I should be pleased to see salt manufactories established along the whole course of the Florida Reef.

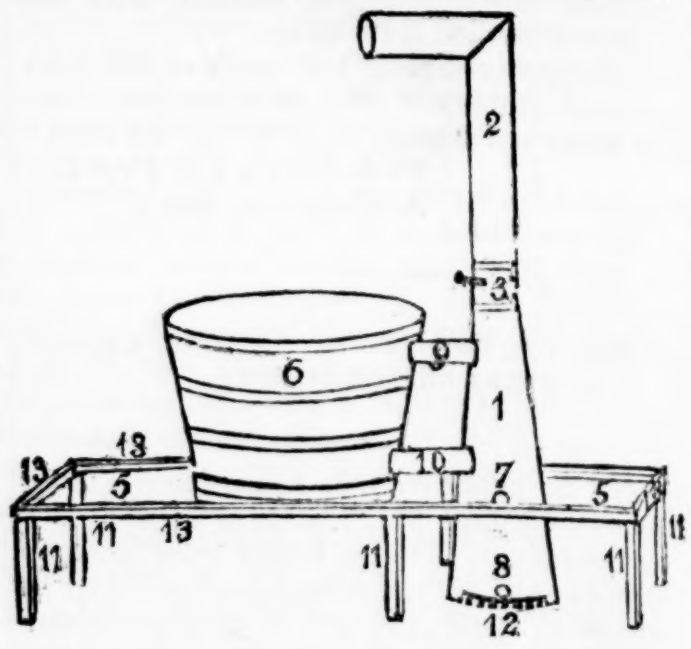
† I was aware of the objection which, for the reason stated above, might be made against the alledged fact, and quoted two analogous facts from the correspondence of Linnæus, published by Sir James Edward Smyth.

than is generally apprehended. In the countries of Europe, when the value of labor, fuel, time and money, is properly estimated, implements for cooking and preparing the food of farm stock are in general use. Your Register, and other works to be relied upon, give numerous proofs of the efficacy of this mode of fattening cattle and hogs, and of feeding milch cows and stock.

In the absence of a fair reward for our labor by the customary application of it, we must become bankrupt if we do not pursue a different and improved mode of applying it, change our habits of expenditure, and adopt a general and permanent system of economy in all the branches of agricultural husbandry.

There must be a beginning in this reform, which, when effected, will be worth all the reforms ever promised or made in the administration of our government since the presidency of the illustrious Jefferson. Let us then, commence with the use of an implement which will enable us to fatten two beeves or two hogs with the food now given to one—which will double the quantity of our milk in winter—and greatly economize time and fuel in washing clothes, &c. &c.

I know nothing of the implement or structure employed in cooking grain for stock, which is referred to in the article from the 'Farmers' Cabinet;' there is one, however, which I have in use, whose value I can attest. Several individuals have purchased, for this county, the patent right of this machine, which is admirably adapted to the purposes above mentioned. I will give you a description of it. Suppose two coffee pots, one holding a gallon and the other three quarts, deprived of their spouts, handles, and bottoms; insert one within the other, force the upper and lower edges of their peripherics together, and have them well soldered, thus you will have a double cylinder; cut in the outer sheet, within an inch of the top, as also eight or ten inches lower, two circular pieces cut about two inches in diameter; over these holes two copper pipes about five or six inches long are to be soldered, at the bottom of the cylinder, at a right angle to the pipes. Cut a hole an inch in diameter and solder over it a pipe (to draw the remaining water off) of about four inches long. Two arms of copper, (cylinders,) about an inch in diameter, and three inches long are then to be soldered on the outer cylinder just above the centre of gravity, when the cylinder is held erect or vertical. At the bottom in the inside of the inner cylinder, place an iron grate like that part of a gridiron on which the broiling is done. Let there then be placed an iron pipe (stove pipe) about five feet long on the top of the cylinder, having a hole cut near the bottom of it, and closed by a door, (hung on wire hinges,) about 5 by 8 inches. The machine for *heating* the water being now complete, you next have tubs made of such sizes as desired, and have holes bored for the insertion of the two pipes first mentioned. A frame about 5 feet long and wide enough for the arms of the cylinders to rest upon. The lower hole to be placed at the bottom of the tub, placed upon four or six legs, is then made. The places where the arms are to rest are grooved out of the proper size on the bars of the frame, the machine is placed upon the frame, the tub for boiling is also put upon it and adjusted to the boiler. The tub is then filled with water. Fire is placed on the grate, and the cylinder filled with chips or small wood, in fifteen minutes the water will boil. In speaking of the coffee pots I have done it simply for elucidation. The double cylinder of copper should be, for common purposes, about two feet six inches high, the diameter of the bottom or lower muzzle about ten inches, and of the upper about seven.



Explanation.

No. 1.—The boiler.
2.—Stove pipe.
3.—Door for wood in the bottom of stove pipe.
7.—Arms on which the boiler rests on the frame.
8.—The pipe to draw the water off that remains in this boiler.
9 & 10.—Two pipes attached to the boiler and inserted in the tub.
12.—The grate.
6.—The tub for the water, &c., to boil in.
5.—The frame for the boiler and tub to rest upon.
11.—Legs of the frame.
13.—Bars of the frame.

With a few chips, a bushel of potatoes, apples, corn, &c. &c. can be boiled in *half an hour* from the kindling of the fire. If it be desirable to boil a greater quantity a larger tub will be employed. By the use of this machine in boiling wheat-chaff and apples, the milk of my cows was more than doubled. In washing clothes the advantages are equally great, so in scalding hogs. A person not far from here used one of them in preparing the water to scald about 20 hogs; he heated the requisite quantity of water in a hogshead in one-fourth of the time required by the usual mode of hot-stones; and, instead of consuming near a *cord* of wood, *he used but one arm full and a half.* For fattening animals the agency of this machine is very valuable. It is also portable, all its fixtures may be carried in the arms; it is as simple as can be in its structure, and does not cost, or ought not, more than $8. They are made here by a copper smith, and are also made for sale in Baltimore.

I send you herewith a roughly drawn figure of this machine, which will give you a better notion of it than my written description. J. R. W.

THE DIVINING ROD.

From the Farmers' Cabinet.

In almost every age there havs been those who have had faith in the virtues of the divining rod

for the discovery of springs of water in the earth, but the number of these have been few indeed, at any period.

During a residence of five years in the Island of Jersey, (England,) I had continual opportunities of testing the truth of the pretention; for there lived within half a mile of my house, a person who, every one admitted, possessed the power to an unlimited degree; but knowing that I could at any time indulge in the experiment, I neglected to do so until my removal from thence, when I regretted that I had allowed the opportunity to pass without convincing myself of the truth or falsehood of a *phenomenon* which has interested the world for so many ages.* I had, however, very unexpectedly, an opportunity of re-visiting the island, and then I determined to satisfy myself on the subject. For this purpose, I visited, in company with a friend,† the person above alluded to, and the result is as follows: His name is Ingouville, a resident on his own estate, within a short distance of the town of St. Heilier's, on the Trinty Road, and a highly respectable man. He received us in the most friendly manner, professed himself ready to accompany us, and to make us acquainted with every thing relating to, what he himself accounted, a most wonderful circumstance. He began by furnishing himself with an elm twig, the size of a small quill, cut from the tree so as to form a fork, Y, and taking the double twigs, one in each hand, with the single point forward, he walked into the garden where was a spring of water, not, however, discernible on the surface. On approaching the spot, he desired me to grasp the twigs, which extended beyond his hands, and say if I found them tremble as we walked forwards; in a short time I felt them very sensibly affected, and saw the single point of the rod tending downwards to the earth; he then asked if I felt them twisting in my hands, from an inclination to follow the downward tendency of the point? which I did; he bade me grasp them tightly, with a view to prevent the single point from turning; but this I could not do, although he held the rod very loosely, to give me every facility for so doing. After a few more steps, the point of the rod turned down, in a direct position, towards the earth, in spite of all my endeavors to prevent it. "There," said he, "is the spring," and as I liberated the ends of the rod from my grasp, they immediately took an upright position, correspondent to the downward position of the point of the rod. He then approached the same spot from the opposite sides with precisely the same results. At my request, he repeated the experiment several times, until I was abundantly satisfied of the truth of all that I had heard relating to this curious and wonderful performance. He afterwards pointed out other spots, always with the most perfect success. When I expressed my astonishment at what I had witnessed, he assured me he was at a loss to conceive of the power which resided in him, and was very desirous of knowing if it could be accounted for on philosophical principles. He told us, at the time of the first French revolution, many of the Roman Catholic priests fled for refuge to the Island of Jersey, and amongst them was one who was said to possess the power of discovering springs of water, by means of the divining rod; he was then building the house where he now resides, and having no water, he thought it a good opportunity to put the experiment to the test; he therefore invited the priest to his house, and requested him to try his skill: this he did, and discovered a spring of water a short distance from the building. "I then," said he, "desired him to permit me to try if I also possessed the power, and on taking the rod into my hands found that I did to a greater degree than himself! The discovery quite overcame me, and I should have fallen, had I not supported myself against the wall. I afterwards, by means of the rod, found a spring immediately under the foundations of the new building, and I did not hesitate to dig to it; but, to do this, it was first necessary to turn an arch in the wall, to take off the weight from the foundation, which I did, and struck the spring within 9 inches of the depth which I had calculated." And there I saw the arch (a standing memorial of the truth of what he had related) stretching across a well, which yields a never-failing spring of the purest water. He added, "Since this, I have been sent for, far and near, to find springs for my friends, and I have never been deceived in my operations, although more than 2,000 wells have been dug by my directions." He is enabled to calculate the depth of the spring, by measuring the distance between the spot at which the rod first becomes agitated, and that at which it takes a decided turn downwards, and has attained a surprising exactness in these his calculations. He was requested by Sir T. Le Breton, the Lieut. Baillie of the island, to search for a spring at his house at *Bagatelle*, as the well, from which water was obtained, was only a land drain: singular enough, he could find only one spring, and that was at the *bottom of the well!* "go deeper," said he, stating the depth according to his rule, "and you will find plenty of water." I, sometimes after, received a letter from my friends, Messrs. Jean and Marrett, brewers, stating that Mr. Ingouville had discovered a spring on their premises, *four feet only from their old well*, (a land drain) which furnished plenty of the finest water for all their purpose. Mr. James Hemery, intending to erect a house in a beautiful field near St. Hellier's, Mr. Ingouville searched for a spring, and pointed out the spot where it might be found, stating the depth at which it would be struck; and, without hesitation, Mr. Hemery commenced building in the faith of his prediction, so that the well, when dug, might be enclosed by the court yard wall, and at exactly this spot he found it!

The Island of Jersey is of primitive, or granite formation, of an almost impenetrable character, yet no one, in need of a well, hesitates to dig at the spot pointed out, and frequently, the price for digging has been fixed before-hand, by means of his rule for judging of the necessary depth.

After Mr. Ingouville had satisfied me of the truth of what I had heard on the subject of water finding, he informed me that he had the power of finding money also; he requested me to bury a silver coin in the garden, walking from me, to show he did not wish to see the spot where it had been deposited; *he found it in an instant*, and then related a singular circumstance which occurred during a late search for a spring of water—

* I have heard that in Cæsar's Commentaries, mention is made of the divining rod, in use for the purpose of discovering wells of water.

† The Rev. Francis Perrot.

many persons were collected to witness the result, but as he passed amongst them he perceived the rod to become agitated in an unaccountable manner, while passing a particular spot, which was crowded by these persons who were looking on; he retracted his steps, but still the rod was affected in the same way; at length, he inquired if a lady, who stood close to the spot, had any considerable quantity of money with her, when she produced a very large quantity of silver in her reticule! after this was removed, the rod performed as usual.

Now I have never heard any attempt to account for the wonderful power which is certainly possessed by this person; possibly, it may be, that there is an affinity between persons of moist constitutions, and the moisture of the earth, and the rod may operate as a sort of conductor: would your friends and contributors do what they can to throw light on the interesting subject?

To those who have not had the means of ascertaining, by actual observation, the truth of what is above stated, it might be interesting to remark, that Mr. Ingouville is a most respectable man, advanced in years, the cultivator of his own estate; independent in circumstances; has never once practised for reward, and will accept of none; and what is better than all, makes no secret about it; declares he is quite ignorant of the means by which he is enabled to operate, but is ready, at all times, to communicate all that he knows about it for the benefit, or to satisfy the curiosity, of any who will call on him for the purpose.

I have been thus particular as to time, place, and persons, in the hope that there might be those amongst your readers who may, from their knowledge of the circumstances, be able to corroborate what I have said relating thereto. The names of those whom I have mentioned, must be familiar to all who have visited the Island of Jersey; and I trust I might through the medium of the pages of the Cabinet, become acquainted with some, with whom I may renew the pleasurable recollections of the period which I passed in that very beautiful and delightful spot.

JAMES PEDDER.

21*st April*, 1839.

For the Farmers' Register.

ESSAY ON VEGETABLE PHYSIOLOGY.

By GEORGE D. ARMSTRONG, Prof. of Nat Philosophy and Chemistry, in Washington College, Va.

[Continued from page 429.]

CHAPTER XVIII.

VEGETABLE EXCRETIONS FROM THE LEAVES AND STEM—FROM THE ROOT. ROTATION OF CROPS.

Besides those substances which are found deposited in the bark and wood of plants, and which we must suppose, if not useful, at least to exert no deleterious influence upon their growth, as there is no effort ever made by plants themselves, to get rid of them; there are others, which we must conclude to be of a different character, as we find them constantly thrown off by plants during their healthy growth. As the roots of plants appear to be capable of making no selection in absorbing their food from the soil, but take up every thing which is presented to them in a sufficiently fluid form, a power of rejecting such matter as is found unsuitable to their nourishment, is necessary to enable them to keep their vessels from being clogged with foreign matter, and thus rendered unfit for the performance of their vital functions. A part of this matter thus rejected by plants exudes from the stem, leaves and flowers, and a part is thrown off by the roots, and deposited in the soil. The elements thus rejected by plants, are not thrown off in their simple elementary condition, but differently combined with each other, so as to form a class of substances, which form their manner of production, have been termed "vegetable excrements." In this particular, these is a striking resemblance between the vital action of plants and animals, and this excrementitious matter thrown off by plants may be considered as precisely analagous to that portion of the food of animals which is voided after all that was nutritious had been selected from amongst it.

The following notice of some of the substances excreted by the stems and leaves of plants is taken from a work of Prof. Lindley. "Acid excretions are formed by the hairs of the chick-pea, the stag-horn sumach and some other species; and it is supposed that the singular property which some lichens possess of imbedding themselves in calcareous rocks is owing to their excretion of oxalic acid. The stinging power of the nettle is produced by an acrid matter excreted by the hairs with which their leaves and stalks are covered. The nettles of Europe simply produced an uneasy sensation, but some of those of India have brought on lock-jaw, and even death itself, by the torments which they inflict. A discharge of sticky matter by the hairs or by the bark of plants, is of very common occurrence. It is this which gives their viscidity to such plants as the rose acacia, to the buds of the horse chesnut, and to the young leaves of the beech tree. In many cases this sticky matter is analogous in composition to common bird-lime. Wax, or some substance analogous to it, is of very common occurrence on the surface of plants. In some instances it is excreted in such quantities as to render its collection an object of trade. The candle-berry mystle (*myrica cerifera*) has its berries covered with a thick coat of vegetable wax, forming in general about one-ninth of the whole berry. It is obtained by throwing the berries into boiling water, when the wax is melted, rises to the surface, and is collected for use. The wax palm (*ceroxylon andicola*) has its trunk covered with a coat of wax resembling myrtle wax in its character. Saccharine matter, in different forms, is also a common excretion from many plants. European manna is discharged by the flowering ash (*fraxinus ornus*) either in consequence of wounds artificially inflicted on the branches, or of the puncture of insects. The manna spoken of in scripture is yielded by a species of tamarisk, and by the camels-thorn, a plant which is common in the deserts of southern Asia. But the most curious instance of matter excreted from the leaves, is afforded by the fraxinella. The leaves of this plant are covered with little brown glands which excrete a species of volatile oil. In warm weather this oil is converted into vapor and surrounds the plant, as an inflammable

atmosphere, readily taking fire when a flame is brought in contact with it, and burning without doing any injury to the plant."

The office of excreting such matter as is found unsuitable for the nourishment of a plant is not confined to the stem and leaves but is in fact performed by the root to a much greater extent than by any other organ. That roots in some cases give off a peculiar matter, has been known for a long time; but it is only within the present century that this has been admitted to be a function common to all roots. As has been already remarked, the possession of the power of rejecting such matter as is found unsuitable for their nourishment, would seem to be a necessary condition of the life of plants; did they not possess it, their vessels must soon become clogged, and rendered unfit for performing their appropriate office. From some experiments which have been performed, it would seem that plants possess the power of disembarrassing themselves of all kinds of matter which are found unfit for their nourishment. Macaire took a plant of mercury (*mercurialis annua*) and having divided its roots into two parcels, introduced one of them into a glass containing a week solution of acetate of lead, and the other into a glass of pure water. At the end of a few hours he found that the glass of pure water had become perceptibly tinged with acetate of lead, which of course must have been taken into the circulation by the roots on one side of the plants, and thrown off again by the roots on the other. In this instance the excreted matter was thrown back without having undergone any change; as a general thing, however, this is not the case; thus, leguminous plants, of which the pea may be mentioned as an axample, although they absorb only carbonic acid and water, will excrete the elements of those substances combined so as to form a species of gum. Grasses excrete principally certain alkaline and earthy muriates, and carbonates, but very little of any gum; papaveraceous plants excrete a bitter matter analogous to opium; euphorbias a gum-resin of a yellowish white color, and an acid flavor.

From observation, we learn that the matter excreted by plants is, as a general thing, thrown out in such a condition as to be, not only unfit again to enter the system of the plant rejecting it, but positively deleterious; and further, that the excretions of different plants differ so much from each other, that whilst that thrown out by a plant is deleterious to others of the same species, it is sometimes well adapted to the nourishment of those of a different species. This fact will explain some of those rules which experience has taught the practical agriculturist. For instance, the rule that the same crop should not be grown for several years in succession upon the same piece of ground. It will not do to say, as is often done, that a second crop of wheat will not grow as well upon any given spot, as the first, because that spot has been exhausted of too great a portion of its nutritive matter by the first. This it is true is one reason, but if it be the only reason, or even the principal reason, we may ask, how is it that a crop of corn will succeed almost as well as if the wheat had never been grown there? The true explanation seems to be that the failure of the second crop of wheat arises not so much from the exhaustion of the soil, as from the existence in the soil of a portion of matter positively deleterious to wheat, deposited by the first crop; at the same time this matter is not injurious to the corn, and hence that crop will succeed when wheat would fail. To grow the same crop for several successive years upon the same spot, is, as De Candolle has very pertinently, though perhaps not very elegantly remarked, "like feeding an animal upon its own excrements." It is much to be desired that this matter should be made a subject of more careful and more accurate experiments than it ever has as yet, as it is one which would doubtless admit of very important practical applications. If the precise nature of the matter retained and of that rejected by each of the crops in common cultivation could once be ascertained, it would seem to be an easy matter to determine the best order in which those crops should succeed each other. Perhaps too if this subject was better understood, we should find that the way in which some manures benefit land, is not by supplying nourishment to the plants growing on it, but by removing this deleterious matter from their roots. If this matter possessed the character of an acid (and there are several facts which seem to render it almost certain that such is the character of the matter excreted by many plants) lime would act in this way; being a salafiable base it would unite with the acid and neutralize its properties. The rotation of crops is a matter very generally attended to in farming, but in gardening, where it is of still greater importance, it is frequently neglected; and as a necessary consequence, garden plants degenerate under so injudicious a system of cultivation. Our best gardeners have been taught by experience never to sow the same plant even for two years in succession upon the same spot of ground.

When the root of a plant is cut off, and the stem placed in water, the excrementitious matter which in other circumstances would have been discharged from the roots, issues from the end of the stem. Hence it is that water in which flowers have been kept for some time, always becomes offensive. We commonly say that the water has become putrid; but pure water can never become putrid, the offensive character of the water in such circumstances arises entirely from the rejected matter excreted by the stem. It is a fact, which I suppose all must have noticed, that some plants when placed in water together seem to keep each other alive, whilst others produce just the opposite effect. This is owing to the nature of the matter excreted by their stems. Where the matter rejected by one plant is of such a nature as to be suited to the nourishment of the other, they will keep each other alive; but where the opposite is the case, they will hasten each others death. In the same way we explain the fact that a nosegay composed of many different flowers, will, when placed in water, generally preserve its freshness much longer than one composed of the same number of flowers of the same species. There is a class of plants commonly called weeds which cannot grow in the immediate neighborhood of our common cultivated plants without materially injuring them. This is doubtless in part owing to their consuming the nutritive matter contained by the soil, and in part also to their overshadowing the cultivated plant and thus shutting it out from the direct action of the sun, but it is also in part owing to the nature of the matter which they deposite in the soil. The common opinion that weeds poison the plants

in whose immediate neighborhood they grow, is not mere imagination, it is nothing more than a simple statement of the facts of the case.

It is a curious fact, frequently noticed by botanists, that plants in their wild state, grow in natural groups. This is in part, to be attributed to the varying nature of the soil, such plants as prefer a sandy soil, being collected together where such a soil occurs; and in part also to the operation of the matter deposited by them in the soil. Such plants as deposite matter of a nature fitted to sustain and assist each others growth, will generally be found growing together. It would seem, that in parcelling out the earth, the creator has not assigned particular species of animals alone, to particular portions, and given them the means of defending themselves against the aggression of their neighbors; but that he had taken the same kind of care for plants, at least to a certain extent. If a seed of a plant which properly belongs to one portion, is by accident, thrown upon another, the plants to which that portion belongs, soon destroy it. Thus has the creator fixed for every separate portion of creation, "the bounds of its habitation."

Chap. XIX.

EFFECT OF THE CHANGE OF SEASON UPON VEGETATON. POSITION OF THE SAP AT DIFFERENT SEASONS. DRY-ROT—METHOD OF PREVENTING IT. PROPER SEASON FOR TRIMMING TREES.

A periodical cessation of growth appears to be necessary to the healthy action of most plants, and in this particular we cannot but notice an admirable adaptation of the constitution of plants to those changes of season, which, in some form or another, are common to all climates. It is true, that within the tropics, vegetation is not affected by the alternate heat and cold experienced in extra-tropical regions; but yet, very much the same effect is produced upon plants by the change from the rainy to the dry season in those climates, as by that from summer to winter in our own. The effect of the dry season in the one case, and of winter in the other, is not however to produce an entire cessation of all growth; as it appears from experiment that vegetation is at all times more or less active; in the winter it is languid, whilst it is energetic in the spring and summer. The fact that the buds of most plants swell, and that all plants form additions of greater or less extent to their roots during the winter, forbid us to entertain the idea that there is a total cessation of vegetation at that season. But although plants appear to have the power of absorbing fluids by their roots during the winter, they can have but little opportunity of parting with any portion of it again by evaporation, and as a necessary consequence, their tissues become distended and turgid with the sap thus accumulated. This turgidity of the tissues is at its maximum just before the season at which plants put forth their leaves, and is eminently favorable to rapid growth when vegetation resumes its activity. "It is a well known fact, that after very long winters, or when a plant has been prevented by artificial means from shooting at its usual season, its branches and leaves are developed with extraordinary rapidity," a circumstance to be ascribed entirely to the accumulation of sap in the tissues.

The diurnal changes from light to darkness appear to be equally important to the well being of plants with the annual changes from summer to winter. "If plants were kept incessantly growing in light they would be perpetually decomposing carbonic acid, and would in consequence become so stunted that there could be no such thing as a tree, and this is actually the case in polar regions where the day and night are each of six months continuance. If on the contrary they grow in constant darkness their tissues become excessively lengthened and weak, no decomposition of carbonic acid takes place, none of the parts acquire solidity and vigor, and finally they perish. But in ordinary circumstances, plants which in the day become exhausted by the decomposition of carbonic acid, and by the emptying of their tissues by evaporation, repair their forces at night by inhaling oxygen copiously, and so forming a new supply of carbonic acid, and by absorbing moisture from the earth and air without the loss of any portion of it. Such being the case, we must conclude that plants grow chiefly by day, and this is conformable to the few observations which have been made on this subject. Meyer found that the stem of a belladonna lilly, and plants of wheat and barley, grew about twice as fast by day as by night; and Mulder states that he has arrived at similar conclusions in watching the development of other plants.

When speaking of seeds and underground stems, the fact was mentioned that the nutritive matter which they contain, and which constitutes their value as articles of food, is, in the economy of vegetable life, intended for the sustenance of the young plants to which they give origin, during the early stages of the growth of those plants, and before they have become sufficiently developed to acquire nourishment for themselves. The heart-wood of trees appears to stand in a somewhat similar relation to the young buds of a tree, serving during the winter as a depository for the turgid sap which the plant accumulated, and yielding it up again, so soon as the flow of the sap has fully commenced in the spring. The sap which accumulates in the sugar maple *(acer saccharinus)* during the winter, contains a large portion of sugar in its composition; in the spring, as the watery sap imbibed by the roots ascends the stem, it gradually dissolves this sugar out from the heart-wood, and carries it up for the nourishment of the then swelling buds; of course, the higher the sap ascends the stem, the more of this sugar will it have dissolved; and this is the reason why, it is found necessary, in tapping that tree for the purpose of obtaining sugar from its sap, that the openings should be made high up the stem, and not near the root; and further, that they should be made to enter the heart-wood, and not to pass through the bark alone. I know that these facts respecting the sugar maple have been adduced in support of the idea that there is no such thing as a downward flow of the sap, and that its elaboration instead of taking place in the leaves, takes place gradually during its ascent; but the downward flow of the sap is established by so many incontrovertible facts, that even if we could not give any explanation of this matter, we could by no means admit

it as establishing the theory just adverted to. But in this matter we are not left to mere conjecture. That the facts respecting the sap are as I have stated them, any one may satisfy himself by a very simple experiment. Let a young oak or maple be cut in June, and a piece taken from the body of the tree be laid upon the fire; after a little while there will appear a wet circle, describing the exact thickness of the sap-wood, and when it becomes thoroughly heated, the vapor will rush with violence from the vessels of that part of the wood, whilst there will be but little, if any, appearance of vapor over the surface of the heart-wood. Let another stick precisely similar in character, be cut in January, and subjected to the same process; so soon as the stick becomes heated, the whole surface of the heart-wood, excepting perhaps a very narrow circle immediately around the pith, will become wet, and send forth steam in abundance, whilst the sap-wood will remain perfectly dry. If the sap which issued from the heart-wood in the last experiment be tasted, it will be found very sweet, thus rendering it certain that sugar enters largely into its composition. The facts of the case as thus ascertained by experiment are, 1st, that the heart-wood contains during the winter a large portion of sap very rich in sugar; 2nd, before the summer has fairly set in, this is all removed; and 3rd, that in the spring a watery sap enters the roots of the tree, and flowing up partly through the heart-wood, becomes more and more richly charged with sugar as it ascends. In view of these facts, can any one hesitate which explanation to adopt?

A knowledge of the position of the sap at different seasons of the year, is of great importance to those engaged in cutting timber; and as all farmers are oblige to engage in this business more or less frequently, they will find this a matter well worthy of their attention. It is now, I believe, universally admitted that, that disease so fatal to timber, the *dry-rot*, arises from the presence of the sap, more especially of the thick turgid sap which cannot be well removed by seasoning. If then such sap fills the tissues of the heart-wood during the winter, whilst they are free from it in the summer, we will at once see the bad policy of cutting timber in the winter, as is the common practice; and also a reason why the timber of the ancient Romans (who it is believed usually cut their timber in the summer) lasted so much longer, than our timber at the present day. I do not know that I can place this subject fully before my readers in any better way, than by transcribing a part of a communication which appeared in the 34th vol. of the American Journal, written by Phineas Rainey, a ship-builder of Connecticut.

"It was the general custom here, to cut timber for vessels in the winter, notwithstanding they went into decay, and wanted repairing in about seven years, or from that to eight, whilst a few only lasted twelve years. I ascribed this variation in their durability to the fact that the cutting of timber was often commenced in October, and then continued through the intermediate months to March. I therefore concluded that the right season was in December, when I supposed that the sap was certainly in the roots, and if cut at this season, I believed that it would leave the deadly poison in the stump, whilst the body and branches would be entirely free from its influence. I determined to carry this opinion into practice the first opportunity that occurred.

"In 1810, I was concerned in the building of a small freighting ship, of which I was the sole conductor, from her keel until she was completed and ready for sea. According to my previous determination, I commenced the cutting of the timbers for her in the early part of December, and continued it into the first week in January. By so doing, I expected to produce the very best ship for durability on the Connecticut river, where there were then numerous vessels building. The timber selected was white oak and white chestnut.

The vessel advanced, and in April it was found that three of the quarter top timbers were wanting, and (as very crooked pieces were required for these) I was obliged to go into the woods and have them cut. Sometime in May, it was found that the stick designed for plank-sheers (this was very large, and intended to make the whole that was wanted,) would not answer the purpose, except that it was barely sufficient to go around the bows, the other part being badly rent and of course rejected. I therefore went into the woods a second time, when the leaves were full grown and the bark would peel, and had two thrifty white-oaks cut for the after pieces. These timbers were put in immediately, and so were the plank-sheers, without any seasoning whatever, and the room between the timbers above the air-streak was filled with salt, which was supposed to be a preventive against the dry-rot. The workmanship was of the first order.

"The vessel was launched and completed in July 1811. That autumn she went to sea, and after the declaration of war in 1812, she came to Middletown and was laid up until the peace of 1815. In that spring when she was to be fitted out again, it was found that she must be repaired in her hull; and on opening her, it was perceived that the dry-rot had made such destruction among her timbers, that it was necessary to build her anew from her middle-wale up. But the three quarter timbers spoken of, which had been cut green, were sound, and appeared new, although their neighbors on each side of them were destroyed by the disease; and it is a remarkable fact, that the spikes, when pulled out of them, were bright, and appeared new; but those parts of them which come in contact with the outside planks, (which were made from timber cut in December,) were badly oxidated, so much so that they were reduced in size about one quarter. The forward plank-sheers which it will be remembered were cut in December, were destroyed by the disease; but the after pieces were sound and dry, and on the under side appeared like new timber seasoned in the shade, and what is remarkable as to them is that although some of the timbers on which they rested were so decayed that they might be picked to pieces; yet there was not the least appearance of it on them, which showed that although surrounded by corruption, they were themselves at least up to that period incorruptible. Thus it can be seen, as respects this vessel, that not only the season of the year, which in the popular opinion is the best to cut timber in for the purpose of making it last well, was strictly adhered to, but also the precautionary measure of applying salt, which is even at this day thought to retard the progress of the disease.

"Although at that time it was not thought neces-

sary to repair this ship below the middle-wale, yet I have every reason to believe that the poison had begun its work in her timber from light-water mark to her top-side; for, in 1816 or 1817, in a perfect calm, she sank at sea, a poor miserable decayed hull, a melancholy comment on the folly of cutting timber for vessels in the winter months. By inquiring since, I have always found that of those vessels which last the longest, the timber of which they were constructed was cut the farthest from December. When I have known the period at which certain trees have been cut, and also their locality, I have afterwards year after year examined their stumps, and watched their decay; and have invariably found that in those of them which were cut in the winter, the disease first made its appearance in the heart-wood, and continued its ravages until that was destroyed, and up to that period the alburnum was comparatively sound; whilst in those which were cut in the summer, the disease first made its appearance in the alburnum, which in a few years entirely disappeared, whilst the heart-wood remained sound.

"There are numerous facts in the most common transactions of life that will sustain me in my position. I believe that the general practice throughout the northern and middle states, is to peel such trees as are to be manufactured into ship plank; by saving the bark, this probably makes the business more profitable than it would otherwise be. It is invariably the case that by the time the plank has become thoroughly seasoned, the alburnum becomes so much injured by the dry-rot as to be unfit to be used; and for my own part, I never saw any timber of this sort, where the heart-wood was affected at all, unless the tree had evidently contracted the disease before its death. The season for peeling is from the third week in May to the second in June. Farmers cut their rails in the summer, when the bark will peel, and they last from fifty to a hundred years. They account for the fact in this way; if they cut them in the winter, the bark will stick fast to the rails, and after a little while, the water gets under it and causes them to decay sooner. On the contrary, they cut their posts in the winter; probably this is done for the convenience of cutting holes in them at that season; and although their rails last so long, yet their posts begin to decay in seven or eight years, according to the soil in which they are placed. When from necessity they are obliged to cut a few posts in the summer, (with the expectation however that they will soon decay) if they last thirty or forty years (and there are instances of this kind) they speak of it as a very remarkable circumstance but never inquire into the natural cause, nor alter their practice. There are other instances of the extraordinary longevity of timber; wooden abutments to bridges, pumps, piles, foundations of weirs, coffer-dams &c, a full notice of which would fill a volume; all going to show that there is a season in which if timber be cut, it will last for many years beyond the average time for which it now lasts; and that there is a season in which if it be cut, it will not last over eight or ten years, notwithstanding any artificial process through which it may be made to pass. In my opinion, June is the best time in which to cut timber, in order to make it last, though I do not suppose that it would make any great difference if it were cut in either of the other summer months.

"At the period at which I was strenuously advocating the doctrine of cutting timber in the winter, I had a small apple tree which had been engrafted with a choice fruit, and had been growing perhaps seven or eight years. There was one limb on it which I did not like, because it was growing in a wrong direction. I took it off in December, because I believed the sap to be then in the roots, and therefore at this season there would be none of it wasted or taken away with the limb, and of course the branches left would receive a greater portion of nourishment in the spring. Sometime afterward, I examined the tree, and found that the part or stump of the limb which remained within the surface of the body, was affected with the dry-rot in its purest type. I removed this with my knife, and found that the disease had made its attack on the body of the tree itself. The tree, after the limb was taken off, became sickly, and its fruit after it began to bear was imperfect.

"I would here observe, that it is the common practice, when people cut the timber of a house frame, to do it in the winter, because, as they think, it will be more durable; but they will not trim their trees at that season, because they have learned from experience that if they do, the trees will contract the dry-rot; therefore they do it in the spring. But Dr. Ives of New Haven, goes even further; he trims his trees in June, and thinks they do better at that season of the year, because the wounds heal quicker. This is right, for as the immediate cause of the disease is not contained in the heart-wood at that season, therefore the remaining stump being almost all heart-wood, can never be attacked by the disease, and the wound will heal quicker; but if the trimming be done in December, the cause of the disease is contained in the stumps at that season and as they cannot be removed, the consequence is, that the disease soon attacks and destroys them, and then the wound will never heal. Although trees thus situated, may by their abundant foliage, their extended branches and their smooth bodies, appear to be in perfect health, (which is sometimes the case) yet they are doomed trees; for the canker having entered into their organization, is preying upon their very vitals, and will sooner or later, prostrate them in the dust."

In the communication from which the preceding statements have been taken, there are many other facts given, all going to establish the same point; viz., that timber should be cut, and trees should be trimmed in the summer, and not in the winter, as is the common practice. I should remark, however, that these statements concern more especially such timber as the oak, chestnut, &c., and not those trees whose heart-wood is filled with resinous matter, such as the different species of pine; in the case of these last mentioned trees, I do not suppose that it will make much difference at what season they be cut. Perhaps it may be objected to cutting timber in the summer, that a farmer is generally so busy at that season, that he cannot spare the time necessary, from his other occupations. But let it be recollected that it is not necessary that the timber should be fully prepared for its intended use at that season, but only cut down, or perhaps even girdling would do, if it be made sufficiently deep to kill the tree, and the work may then be left to be finished at a time of greater leisure. Should a farmer be obliged to hire this

done, the expense incurred would be far more than repaid him, by the additional durability of the timber.

Chapter XX.

Changes in plants, produced by puncture of insects, changes in climate and soil, grafting, budding and pruning, cross fecundation, blanching, and propagation from select seed.

When we look at cultivated vegetables as they are now presented to the eye, we seldom think of the unpromising sources from which most of them have sprung; or of the great changes which it was necessary they should undergo, before becoming fit to minister to the necessities or pleasures of man so largely as they now do; or of the different and distant regions which have been laid under contribution to furnish that variety of vegetables possessed by the different civilized nations of the earth. "The austere crab-apple of our woods, is the original stock from which all our apples have sprung; and the numerous varieties of plum, can boast of no other parent than our native sloe." The fig came originally from Syria, the orange from Media, the peach from Persia, the apricot from Epirus, the pomegranate from Africa, the cherry from Armenia, wheat, probably from the East Indies, maize and the potato, from Mexico. "Wherever man has penetrated, in that spirit of change and activity which accompanies civilization, he has assisted the dissemination of vegetable productions, much more surely and rapidly than birds, or ocean currents, or winds, or indeed all natural agents put together." From a consideration of such facts as these, we may learn to how great an extent the agricultural riches of any country, whether we have regard to the excellence of its products or to their variety, are dependent upon man. There are but few, if any plants, which in the wild condition, are well adapted to use, and there are none which may not be improved by a judicious system of cultivation; and there is no country which can furnish any great variety of useful vegetables, without levying contributions upon other and often distant lands. From all this it is evident, that although the general laws which govern vegetables are fixed, yet vegetables themselves may undergo many changes, both by accidents and from the arts of man. A consideration of some of these changes, and the means by which they are produced, will be the subject of the present chapter.

Among the most important of those causes by which changes are produced in plants are, the puncture of insects, change in climate and soil, grafting and budding, cross fecundation, blanching, and propagating from selected seed. To each of these subjects we will attend, in the order in which it has been mentioned.

1*st. The puncture of insects.*—There are many insects, whose instincts teach them to puncture the bark of vegetables in order to deposite their eggs. Whereever this is affected, a diseased condition immediately ensues in the part punctured, always resulting in the developement of a tumor of greater or less size. This is generally accounted for by saying that the insect, at the same time at which it deposites its egg, deposites along with it some matter which is poisonous to the plant. The formation of the tumor is generally accompanied with the elaboration of some particular vegetable substances which would otherwise, either not have been formed at all, or else would have been formed in very small quantities; and in consequence of their containing this particular substance, whatever it may be, these tumors are collected and used in the arts. A good instance of this is afforded in the production of the nut-gall. Whilst the bud of the species of oak on which these galls are formed, is yet young, a species of cynips drives its piercer into the very pith, and depositing its egg, injects at the same time a small drop of a corroding liquor contained in its bag. The bud being thus wounded, and the juices corrupted by the injected poison, a fermentation is induced, which results in a partial disorganization of all the contiguous parts. The extravasated juice flows round the egg, and is there accumulated, and converted into a sort of spongy lump, which vegetates and augments till it forms the gall. The gall thus formed, furnishes both shelter and nourishment to the young insect so long as it remains in its larva state, but so soon as it has completed its metamorphoses, it eats its way out and escapes. During the formation of the gall, a large quantity of gallic acid is elaborated by the diseased parts, and this it is which fits the gall for its use in the arts.

Perhaps the most curious instance of the effect produced by the puncture of an insect, is that afforded by the fig. "The fig (*ficus carica*) has no visible flower; for the fruit arises immediately from the joints of the tree, in the form of little buds, with a perforation at the end, but not opening, or showing any-thing like petals, or the ordinary parts of fructification. As the fig enlarges, the flower comes to maturity in its concealment; and in eastern countries the fruit is improved by a singular operation known by the name of caprification. This is performed by suspending above the cultivated figs, branches of the wild fig, which are full of a species of cynips. When the insect has become winged, it quits the wild fig, and pierces the cultivated ones for the purpose of laying its eggs; and thus it appears both to insure the fructification by dispersing the pollen, and afterwards to hasten the ripening of the fruit, by puncturing the pulp, and inducing a morbid action of its tissues. In France this operation is imitated by inserting straws dipped in olive-oil. Respecting the puncturing of insects, it is perhaps worthy of remark, that each particular species of insect appears, as a general thing, to be confined to some particular kind of plant, and that the effect produced by each kind of insect is uniform. In form, these tumors differ much from each other; the nut-gall is an irregular ball, the tumor produced upon the leaf of the hickory by the puncture of the gnat, has no regular shape whatever, whilst that produced by a similar insect upon the leaf of the grape-vine, always present the form of a horn and is of a beautiful purple color. The time which elapses between the deposition of the egg, and the appearance of the insect, varies much in the case of different species. The egg which is deposited in the pea whilst yet green, is seldom hatched out until the succeeding summer; whilst other species appear in the course of a very few days.

2*nd. Changes in climate.*—Though plants in

general are limited to certain countries in which they appear as natives, yet some are, and probably the greater number may be, inured to climates soils and situations very different from those to which they naturally belong. The change which a plant undergoes in accommodating itself to a new country is called acclimation. By this process the habits of a plant may be much altered, as we see in the case of the nasturtium, which in Chili S. A. its native country, becomes a tree of considerable size, and does not blossom until several years after it is planted; whilst in our climate it is an annual trailing shrub, blossoming and perfecting its fruit the same year in which it is sown. But though the habits of a plant may be thus altered, yet no device of man can alter its nature. The potatoe which has been long cultivated in Europe, and propagated from seed ripened there, and this through innumerable generations, yet there is no reason for supposing that it is in the least degree more hardy now than when first imported from Mexico. The same slight degree of autumnal frost blackens its leaves, and of spring cold destroys its germinating buds. Annual plants are much more easily acclimated in northern countries, than perennial ores. This we should expect from the fact that the temperature of real summer weather is very much the same in all inhabited lands, the only serious dificulty experienced in removing southern plants to a northern country is that the summer is sometimes too short to enable them to come to perfection. Where this is the case, the proper method to be pursued is to make the change as gradual as possible, removing the plant a little further north each year than it was the year preceding, and thus enabling it gradually to adapt itself to its new situation. Next to annuals, in the case with which they undergo acclimation, we must reckon herbaceous biennial and perennial plants. In northern climates, the frosts of winter are generally accompanied with snow, which falling early in the season, and lying throughout the winter, shelters the root from the inclemency of the atmosphere until the return of spring. Trees and shrubs, on the contrary, are acclimated with difficulty, owing to the great length of their stems and branches rendering it impossible to shelter them from the cold. "The greatest refinement in culture consists in the successful formation of artificial climates, for the culture of tropical plants in cold regions. Many vegetables, natives of the torrid zone, as the pine-apple, palm &c. cannot be acclimated in temperate countries; but by means of hot-houses of different kinds, they are grown, even on the borders of the frozen zone to the highest degree of perfection; and in Britain, some of the tropical fruits, as the pine and melon, are brought to a greater size, and better flavor, than in their native habitation. Casting our eye upon man, and the effects of his industry, we see him spread upon plains and the sides of mountains, from the frozen ocean to the equator, and yet in all situations assembling around him whatever is useful or agreeable from among the products of other lands."

3rd. *Change in soil.*—A change in soil may be effected either by removing a plant from one spot of earth, to another differing from it in fertility; or by the addition of manure, producing a change in the character of the soil in which a plant grows, without changing the location of the plant. The effect of removing a plant from a comparatively barren to a more fertile soil, is to increase the size of all its parts, and often to convert its organs of one kind into those of another. Experience has taught us, that it is advantageous to supply food to plants artificially. Where increase in the size of vegetables, without reference to their magnitude, is desired, it can almost always be accomplished, by affording an increased supply of all the ingredients of the food of plants, distributed in well pulverized soil, in such a manner that the roots of the plant can easily reach it. The effect thus produced, can be greatly increased by additional heat and moisture; and by a partial exclusion of the direct rays of the sun, so as to moderate the evaporation of fluids from the plant. Experience alone can determine to what extent this may profitably be carried in the case of each species of vegetable. The results which have been produced in some instances are truly remarkable. Loudon states that cabbages have been produced weighing half a hundred weight, apples, a pound and a half, and cabbage-roses of four inches in diameter, or more than a foot in circumference. By cultivation and change of soil, the appearance of many trees have been entirely altered. The wild crab-apple, which is the original stock from which all our vast variety of apples have sprung, has its stem and branches thick set with thorns. On removing it to a more fertile soil and more favorable circumstances, all these thorns have disappeared, and their place have been supplied by fruit-bearing branches. Yet all the distinctive characteristics of the tree, the structure of its wood and bark, the shape and arrangement of its leaves, the form and aggregation of its flowers, indeed all that a botanist would consider characteristic of the plant, have remained unchanged. Perhaps the most remarkable changes which result from a change of soil, are those of organs of one kind into those of another. It is by such changes, that all our double flowers have been obtained. The organs which are most commonly converted into others, are the stamens, and next to them, the pistils. In the hundred-leaved rose, and some other double roses, almost all the stamens have been converted into petals; in the flowering cherry, the pistils have been converted into green leaves; in the double collumbine, a part of the stamens have been converted into petals, another part into nectaries, whilst a third part, have retained their original form. The perfect regularity with which the changes have taken place in the last mentioned flower is worthy of notice. Wherever one stamen has been converted into a petal, a corresponding one has always been converted into a nectary; and so regularly have these changes proceeded, that by careful dissection, you may separate one of these double flowers into several single ones, each perfect in itself, and destitute of none of its appropriate parts. Where flowers have been doubled by art, the only sure way of propagating them, is by some means by which the new plant should be nothing more than a continuation of the old one, as by slips or cuttings. Whenever the seed is resorted to, there is danger that the plant will revert to its original type, and the flowers appear single again. A change of color also, frequently results from a change of soil. Respecting the nature of this change, no fixed laws have been as yet discovered. As a general

thing however, the brightness of the colors of a flower is injured by enriching the soil in which it grows; and hence florists, when they wish to procure tulips of very bright colors, prefer planting the bulbs in a light sandy soil, which is rather poor than otherwise.

4th. *Grafting, budding and pruning.*—The object of all these operations is the same, viz. to secure to some part of a plant a greater quantity of nourishment than would otherwise fall to its share, and thus to produce a more full and perfect developement of that part. Where a young shoot is grafted upon a stock three or four years old, it will evidently receive a much greater quantity of nourishment, than it would in its original position or its parent stem. The rules to be observed in grafting and budding, have been mentioned, and the reasons on which they are founded given in a previous chapter. It will be sufficient here, merely to advert to them. The most important are, 1st, that the bark of the graft should have its cellular or vascular tissues, arranged in the same way with that of the stock; 2nd, that the graft should be so placed that the inner surface of its bark shall correspond precisely with that of the bark of the stock. The proper season for grafting, is in the spring, just as the buds begin to swell; the reason for this is, that at that season, the graft is just commencing the period of its most rapid growth, and it will, of course, sooner unite with the stock at that season, than at any other. The object of pruning, is, to remove such branches and boughs as are not wanted, in order that the whole vital energy of the plant may be expended upon such as are left. Of course, which shall be removed, and which left, must be determined by the judgment of the pruner, in the case of each tree. The only general rule, is, that in the case of fruit trees, what are termed water-sprouts, (a class of straight shoots which seldom bear any thing but leaves) should be removed. The proper season for pruning trees, is when the leaves are just fully formed, because in this way, you avoid exposing the heart-wood to an attack of the dry-rot, and moreover inflict the necessary wound at at a time when the tree is growing most rapidly, and when of course the wound will soonest heal over.

5th. *Cross-fecundation and blanching.*—Both of these operations have been fully treated of in the preceding chapters of this essay.

6th. *Propagating from select seed.*—There is perhaps no general principle of vegetable physiology, which it is more important for the agriculturist, who seeks to improve the character of cultivated plants, to bear in mind, than that the offspring will always partake of the characrer of the parent plant to a greater or less extent. This same general principle applies to animals as well as vegetables, and it has been by keeping it distinctly in mind, that the stock of our common domestic animals has been so much improved as it has of late years. In the case of animals, the results have been so striking, that they have awakened general attention to the subject; but in the case of vegetables, although I suppose there are none who would deny its correctness, yet it is generally neglected, or regarded with comparative indifference. Plants, as a general thing, resemble their parent plants in form, in texture, in the abundance, richness, and flavor of their fruit, the time at which they ripen their fruit, in their liability to disease, and in fact, in almost every particular which can affect their value to man.

As this subject will be more fully treated of in a subsequent chapter, we will dismiss it for the present.

(To be continued.)

SALTING BUTTER.

From Anderson's Essays.

On some occasions, a part, or the whole of the butter may, perhaps, be disposed of fresh; but in general it must be salted before it can be carried to market. And as this part of the process requires as great nicety as any other, a few remarks on the subject shall be added.

Wooden vessels are, upon the whole, most proper to be employed for containing salted butter. These should be made of cooper work, very firm, and tightly joined with strong *wooden* hoops. It will be advisable to make them very strong where circumstances permit them to be returned to the dairy; for as it is a matter of considerable difficulty to season new vessels so well as that they shall not affect the taste of the butter, it is always advisable to employ the old vessels rather than make new ones, as long as they continue firm and sound. Oak is the best wood for the bottom, and staves, and broad Dutch split hoops are to be preferred to all others, where they can be had. Iron hoops should be rejected, as the rust from them will in time sink through the wood, though it be very thick, and injure the color of the butter: one iron hoop, however, should be put at the top, and another below beyond the bottom, the projection below the bottom being made deep for this purpose. No form is more convenient than that of a barrel, unless, perhaps, it be that of a truncated cone, with the apex uppermost; as in this case the butter never can rise from the bottom and float upon the brine, which it will sometimes do in the under part of a barrel when brine is necessary. But this inconvenience may be easily obviated, by driving a wooden peg, with any kind of a head, into the bottom before it be filled, as the butter, closely embracing the head all round, will be kept perfectly firm in its place.

An old vessel may be prepared for again receiving butter, by the ordinary process of scalding, rinsing, and drying; but to *season* a new vessel requires greater care. This is to be done by filling it frequently with scalding water, and allowing it to remain till it slowly cools. If hay, or other sweet vegetables are put into it along with the water, it is sometimes though to facilitate the process. But in all cases frequent effusions of hot water are very necessary, and a considerable time is required, before they can be rendered fit for use. The careful dairy-man ought to be particularly guarded with respect to this particular, or he may soon lose his character at market.

After the butter has been beaten up and cleared from the milk, as before directed, it is ready for being salted. Let the vessel into which it is to be put, after being rendered as clean and sweet as possible, be rubbed all over in the inside with common salt, and let a little melted butter be run into the cavity between the bottom and the sides at their joining all around, so as to fill it and make it every where flush with the bottom and sides. It is then fit to receive the butter.

Common salt is almost the only substance that has been hitherto employed for the purpose of preserving butter; but I have found, by experience, that the following composition is, in many respects, preferable to it, as it not only preserves the butter more effectually from any taint of rancidity, but makes it also look better, and taste sweeter, richer, and more marrowy, than if the same butter had deen cured with common salt alone. I have frequently made comparative trials with the same butter, and always found the difference much greater than could well be conceived. The composition is as follows:

Take of sugar one part, of nitre one part, and of the best Spanish great salt, (or of Doctor Swediaur's best salt, which is still better than the former, being cleaner, [or best rock salt,]) two parts. Beat the whole into a fine powder, mix them well together, and put them by for use.

Of this composition one ounce should be put to every sixteen ounces of butter;* mix this salt thoroughly with the butter as soon as it has been freed from the milk, and put it, without loss of time, down into the vessel prepared to receive it, pressing it so close as to leave no air-holes, or any kind of cavities within it. Smooth the surface, and if you expect that it will be above a day or two before you can add more, cover it close up with, a piece of clean linen, and above that a piece of wetted parchment, or, for want of that, fine linen that has been dipped in melted butter, that is exactly fitted to the edges of the vessel all round, so as to exclude the air as much as possible, without the assistance of any watery brine; when more butter is to be added, these coverings are to be taken off; and the butter applied close above the former, pressing it down and smoothing it as before, and so on till the vessel be full. When it is quite full let the two covers be spread over it with the greatest care, and let a little melted butter be poured all round the edges, so as to fill up every cranny, and effectually exclude the air. A little salt may be then strewed over the whole, and the cover be firmly fixed down to remain close shut till it be opened for use. If all this be carefully done, the butter may be kept perfectly sound in this climate for how many years I cannot tell; but I have seen it two years old, and in every respect as sweet and sound as when it was only a month old.

It deserves to be remarked, that butter cured in this manner does not taste well till it has stood at least a fortnight after being salted; but after that period is elapsed, it eats with a rich marrowy taste that no other butter ever acquires; and it tastes so little of salt, that a person who had been accustomed to eat butter cured with common salt only, would not imagine it had got one-fourth part of the salt that would be necessary to preserve it.†

Butter thus cured would bear to be carried to the East or the West Indies, and would keep sweet during the longest voyages, if it were so packed as not to allow the butter to be so far melted as to occasion the salts to separate from it. But as none of these salts admit of any chemical union with the butter, it must happen that if ever the butter be so far melted as to become of a fluid consistence, the salts drop to the bottom, and the butter, deprived of their antiseptic powers, quickly becomes rancid. It would be a great improvement in the culinary art, if any antiseptic substances could be found that possessed any agreeable taste

* It is of great consequence that every process, which requires much thought or nicety, should be banished, if possible, from all branches of manufacture. On this principle, as some difficultuy might arise in proportioning the quantity of salt to unequal weights of butter, I should advise that every person who means to adopt this practice at large should begin with providing himself with a steelyard so constructed as that sixteen ounces in the one scale is exactly balanced by one in the other. And that he may be at no loss to provide himself with this simple apparatus, the following directions may be attended to.

Let him provide two scales of equal weight; one of them should be of wood, and flat, for the butter, no matter what form or materials the other is of; let him then take a slip of deal two inches broad, half an inch thick, and two feet long. Near to each end, and at about half an inch from the same side at each end, make a hole through the board, to which the scales may be fastened by means of a loop of wire; observe, that these two holes should be placed exactly at the same distance from the edge. Let him then load the two scales, one of them with one ounce, and the other with sixteen, and having drawn a line parallel to what will now appear to be the upper side of the beam, at half an inch from the top all along on each side, let him be provided with two sharp-pointed instruments, such as a shoemaker's awl. Let him then try to find a point in the new-made line on each side of the beam, where, when the beam is allowed to vibrate on his awls placed directly opposite to each other, the two weights balance each other. This point he will soon discover to be much nearer one of the ends of the beam than the other. Through this point let him pierce a hole by means of a round hot iron. Through this hole put a piece of thick iron wire, which if supported at each end will serve as a pivot. The apparatus is now complete.

And whenever it is afterwards wanted, nothing more is necessary than to place the butter, whatever be its weight into the butter-scale, and then to put as much of the composition into the opposite scale as brings the beam to a balance; and this will in all cases be the due proportion of salt for the butter, whatever the weight of that butter may be.

† But after this butter has been cured in the most perfect manner, it may chance to be much debased in its quality by being improperly treated during the time it is using. Therefore observe, that, when it is broken up for use, a small portion should be pared from the surface all over, especially near the edges, in case the air should not have been so entirely excluded as it ought to have been. If it be quickly consumed, it may be then spooned up as it is wanted, without any other precaution than that of keeping it carefully covered up so as to exclude dust, &c. from having access to it. But if it be to be used very slowly, and if the person to be employed in spooning it up be not very careful, or so indolent as not to be at the trouble of closing it up at each time with the covers, it may happen that the part which is thus long exposed to the air may contract a small degree rancidity. To guard against this evil, in these circumstances, when the vessel is opened let a strong brine of common salt be prepared that will swim an egg, and poured, when cold, upon the surface of the butter; this will cover that surface effectually, even though the operator should be a little careless, and will thus guard against the inconvenience complained of: for though the quality of the butter will thus be injured in some degree in consequence of the water acting upon it, yet that is an evil of far less material moment than the slightest degree of rancidity would occasion.

and flavor, which was capable of being dissolved in oily substances. This might afford a proper subject for a premium by Agricultural Societies. In the mean time the following hints on this subject may be of some use.

Butter, in its natural state, contains a considerable proportion of mucous matter, which is more highly putrescible than the pure oily parts of the butter. Where it is, therefore, intended that butter should be exposed to the heat of warm climates, it ought to be freed from that mucilage before it be cured and packed up from keeping. To prepare butter for a distant voyage, therefore, in warm climates, let it be put into a vessel of a proper shape, which should be immersed into another containing water. Let the water be gradually heated till the butter be thoroughly melted; let it continue in that state for some time, and allow it to settle; the mucous part will fall entirely to the bottom, and the pure oil will swim at top, perfectly transparent while hot, but when it cools it becomes opaque, assumes a color somowhat paler than the original butter before it was melted, and a firmer consistence, more nearly resembling that of tallow, and consequently it will better resist the heat of a warm climate than butter itself. When this refined butter is become a little stiff, and while it still is somewhat soft, the pure part should be seperated from the dregs, and then salted, and packed up in the same way as is directed for butter. This would retain the salt longer and keep much longer sweet, in hot climates, than if it had been cured in its original state.

This refined butter may be preserved in yet another way, which I have sometimes seen practised here by way of medicinal *bonne bouche* (comfit.) After the butter is purified, add to it a certain proportion of firm honey, mix it well; it will incorporate thoroughly with the butter, and when cold, it eats very pleasantly spread on bread like butter; and may be given to old people, if they relish it, instead of marrow, and to others as being useful for coughs and colds. These were the uses to which I have seen this substance applied, and on these occasions the proportion of honey employed was considerable. I have seen it kept for years, without maifesting the smallest tendency to rancidity, so that there can be no doubt but that butter might thus be preserved in long voyages without spoiling. The only point that remains to be ascertained is, what is the smallest proportion of honey that would be sufficient to preserve the butter. Sugar is known to be a much more powerful antiseptic than common salt, and probably honey may be in that respect nearly on a par with sugar. If so, it would be reasonoble to suppose that one ounce of honey might be sufficient to preserve sixteen ounces of butter. In that case the taste of the honey would not be extremely perceptible, so that the butter, even to those who might not relish the sweet composition above mentioned, might prove very agreeable, especially if a little salt were mixed with it when about to be used. A few experiments would be sufficient to ascertain this particular.

From the circumstance of the honey incorporating with the butter, and not separating from it in a fluid state, it would promise nearly to accomplish the purpose wanted above. Whether, when it became very fluid, and was long continued in that state, any separation would take place; or whether the honey in such circumstances would be in danger of fermenting, are questions that experience alone can determine. Sugar, though it would preserve the butter equally well while it continued in a solid state, would doubtless separate from it when it became fluid. Whether molasses would do so, or what effects they would in this case produce, I cannot tell; but a few experiments would ascertain these points. Should any method of preserving butter in warm climates be discovered, it would be productive of so many benefits to individuals, and to the nation at large, by giving an opening for a new branch of commerce and and manufacture, that it is much to be wished the few experiments wanted to ascertain these points were made, with such care, under the direction of persons who would faithfully report the result to the public, as should be sufficient to remove all doubts upon this head.

P. S. The greatest part of the observations contained in the foregoing pages, were derived from a lady, who is now beyond the reach of being affected by any thing in this sublunary world. Her beneficence of disposition induced her never to overlook any fact or circumstance that fell within the sphere of her observation, which promised to be in any reepect beneficial to her fellow creatures. To her gentle influence the public are indebted, if they be indeed indebted at all, for whatever useful hints may at any time have dropped from my pen. A being, she thought, who must depend so much as man does, on the assistence of others, owes as a debt to his fellow creatures, the communications of the little useful knowledge that chance may have thrown in his way. Such has been my constant aim: such were the views of the wife of my bosom—the friend of my heart, who supported and assisted me in all my pursuits. I now feel a melancholy satisfaction in contemplating those objects she once delighted to elucidate.

FAT MUTTON—SUGAR-BEET.

From the Farmers' Cabinet.

It is to be regretted that so little attention is paid to the proper sheltering of cattle in this country. One would naturally suppose that the interests of owners would point out a proper course; and that once systematized, and the advantages of strictly attending to the comfort and convenience of our cattle made manifest, even to the most skeptical, that whole neighborhoods would adopt the system, and that, in a resonable length of time, it would, very extensively, if not universally, prevail. It is lamentable to say that this is *not* the case. For some reason or other, which I have not as yet been able to ascertain, improvements make but slow advances among our farmers. It may be, that they consider improvements as innovations in those customs which have "grown with their growth." Some, with the evidence before their eyes, evidence which they cannot possibly resist or gainsay, refuse to profit by the experience of others. I have several cases in point, one of which I will note. For a number of years I have been in the habit of attending the Philadelphia market, principally with mutton, and as I always personally superintended my

sheep and other animals on the farm, and saw that they were regularly and sufficiently fed, I generally brought meat which I was not ashamed of, and which by its good quality recommended itself to purchasers, insomuch that I had no difficulty in securing a regular set of good customers, who cheerfully paid a fair price for a good article. Some of my neighbors attended the same market—but as I generally sold out first, they thought I was "uncommonly lucky." Four years since I obtained a quantity of the seed of the French sugar beet, and put in an acre by way of experiment not in the way of making *sugar*, but the making of *fat*. This first trial fixed me. My cows, sheep and hogs were very fond of them, during the long and severe winter which followed. They all kept in good heart and condition; what surprised me most was the rapid manner in which my sheep, fed on the sugar beet, took on fat; and when carried to market the saddles excited particular attention, from their very superior appearance. But it was not in appearance only; the meat was of a much better quality, more juicy, and exceedingly tender. The inquiry was, "why, sir, on what do you fatten your sheep?" And when I replied, on the sugar beet, hay, and a small portion of corn, it would generally call forth an exclamation of surprise. Ever since I have been a grower of sugar beet, the meat I take to market is always in demand, and brings several cents more per pound than that fattened in the old way; and yet, strange to say, some of my neighbors, although I have urged them, will not plant the beet for their stock. I have been benefited to the extent of several hundred dollars by the introduction of this root—the effects are visible—my neighbors know it—and yet they stand lookers on, halting between two opinions. But light is breaking in upon us, and of one thing you may be assured, that is, that the time is not far distant *when every extensive stock feeder will be an extensive root grower.*

To the delinquents, and there are many in my vicinity, I would say, "rouse ye from your lethargy, and although for the present season you have lost the advantage of planting the sugar beet and the mangel wurtzel, yet you may in some measure atone for your past neglect, by putting in immediately a sufficient quantity of ruta baga. You have time enough for this, but none to lose. The ruta baga is an excellent root—plant it liberally—cultivate it thoroughly—and you will find your account in it in more ways than one, if you are spared until the ensuing winter. Depend upon it, there is nothing better for cattle than roots, properly prepared. I put in some of almost all kinds; and I find carrots answer well for a change. But with me the sugar beet is superior to all others. My way of feeding is simple. When the cattle are housed they are kept constantly furnished with good hay, have roots three times a day, with an occasional change to corn or cut feed. I find great benefit from currying my cows—indeed, it seems to me as necessary to curry a cow as a horse—and if any one will make the experiment, as I did on two oxen, it will remove every doubt. They were both put up at the same time—fed precisely alike—and the treatment throughout was similar in every respect, except in the use of the curry comb, and the ox on which it was used was in *reality*, as well as in appearance, six per cent. better than his fellow. The cause of this must be apparent to every reflecting mind.

N. I.

Delaware county, May 18th, 1839.

FREE MARTINS.

From the Genesee Farmer.

When a cow has twin calves, one a bull calf and the other to appearance a heifer calf, the last is called a *free martin*. It is a singular law of nature, and apparently limited to cattle, that twin animals so produced, are unfit for the propagation of their species. The free martin is to appearance a cow, exhibits at times sexual inclinations, and some have been known to receive the male, but always without effect. These singular facts led Dr. Hunter to a physiological examination of their structure; and recently Dr. Allnatt, of London, has examined several with the same object. The cause of this singular animal phenomenon, is found to result from a peculiar vaginal and uterine organization, which effectually prevents conception. The expulsion of the urine was, in the animal examined by Dr. A., propelled in jets rather than a continued stream, and a singular malconformation of the parts, on examination after death, satisfactorily explained the cause. Free martins work well in the yoke, are strong and kind workers together, or with another ox. When allowed to run with the cows, the free martin, unlike the spayed heifer, is particularly on the alert, when the cows are in a condition to receive the male. Why the female of the ox family, when produced as a twin, should alone of all other animals be incapable of reproduction, is one of those physiological anomalies left for future observers to explain.

CORRESPONDENCE ON THE INTRODUCTION OF TROPICAL PLANTS.

[Communicated for publication in the Farmers' Register.]

To the Honorable the Secretary of the Navy of the U. S. A. at Washington, D. C.

Indian Key, T. Fl., April 22, 1839.

Sir—The subscribing trustees of the Tropical Plant Company have the honor to inform the Hon. Secretary of the Navy that near the celebrated pits of water on lower Matacumba, they have now established a preparatory nursery of tropical plants, in which they are ready and willing to receive and preserve all valuable plants that may be brought by our naval vessels under the treasury and navy circulars of the 6th of September, 1827. It may be added that the site of the nursery is about one mile west of Indian Key; and that vessels drawing eighteen feet of water may easily enter and safely anchor within the Reef at a distance of three miles at the most, from said nursery. In relation to *fibrous leaved* plants for the special use of the navy itself, it is respectfully suggested that during the actual hostilities of France with Mexico a precious cargo of living plants may now be extracted from the latter country without that embarrassing opposition from the Mexican authorities which may be expected at all other times, even by

our armed vessels, from Creole animosity to foreign enterprise; and that it is especially important to obtain this summer from Sisal, in Yucatan, and from Goazacoaleos, in Vera Cruz, as many *suckers* as possible of the Agave Sisalana and Bromelia Pita; because it is now *demonstrated* that these superior substitutes for hemp and flax can be readily propagated over the *arid* islands and coasts of Tropical Florida by the *success* of the few plants sent to Cape Florida in 1833 by the American Consul at Campeachy. As, however, the greatest portion of southern Florida consists of *marshy* grounds which are adapted to the vigorous growth of succulent plants of the Banana family, called Musaceæ, and as their offspring arrive at maturity in a single year, (or one-third of the time requisite for the fleshy-leaved Agaves,) it is so much the more desirable to obtain speedily a considerable number of the *Manilla hemp bananas*, called *musa abaca* and *musa textilis* by botanists; and hence the department is respectfully reminded that these incalculably important plants were carried to French Cayenne for the French government, by the same Mons. Perrottet, who at the same time transported to the same places the highly celebrated morus multicaulis from the same Philippine islands; and that hence their fibrous stalked progeny may be early obtained and speedily transported to the hitherto unprofitable marshes of Florida. For many details concerning the fibrous leaved and fibrous stalked plants which yield the foliaceous and petiolar fibres, called Sisal hemp, Manilla hemp, grass hemp, grass flax, vegetable silk, &c.; the department is respectfully referred to communications on file in its own archives from the former consul at Campeachy; and to the articles and plates on the same subjects in the reports of the committees on agriculture of congress which accompanied the bill, become a law, "to encourage the introduction and promote the cultivation of tropical plants in the United States." We have the honor to be, sir,

Very respectfully, your very humble,
And obedient servants,
(Signed) CHARLES HOWE,
HENRY PERRINE.
Trustees T. P. C.

Navy Department, 5th June, 1839.

Gentlemen—Your interesting communication of the 22nd of April last has been received. The department will avail itself when practicable, of your offer to receive and preserve such tropical plants as may be imported into the United States by our public vessels, under the circular of the 6th of September, 1827, to which you make reference.

Hostilities between France and Mexico having ceased, it is now too late to improve your suggestion of the facilities presented by a state of war between those countries. for the importation, this season, of the fibrous plants mentioned in your letter; but the subject will be borne in mind for future action, when circumstances will admit of it.

Wishing you entire success in the laudable and important enterprise in which you have embarked.

I am, very respectfully,
Your obedient servant,
J. K. PAULDING.

H. PERRINE &
CHAS. HOWE, ESQ'S.
Indian Key, Florida,

HARVESTING CORN IN OHIO.

From the Genesee Farmer.

Mr. Editor—As things that come from a distance, are generally esteemed more valuable than those produced at home, I shall venture to give our western method of cutting up corn, and let you manufacture it into what you like.

My plan is to put 120 hills in one shock; others put 144. I commence cutting two rows, advance ten hills, and then stop and tie four hills in the rows, I am cutting, in this manner, +. Then advance, cutting both rows laying five or six hills in a parcel, until I have advanced ten hills ahead; then stop and tie as before, and this makes twelve hills to a shock this way. I then count off eight rows, and commence on two more; then I proceed through the field, or lot intended to be cut. I then put up what is cut up between those hills, having their tops united in as even a manner as I can; set it as nearly upright as possible, placing the buts well on the ground, and in such a manner as to form a neat circle. The corn by this time is generally partially cured, so that I take a stalk or wisp of straw and tie the tops at a suitable height and distance. It is best to let this stand a day or two, in order that it may properly cure. After going through in this order, I commence and cut four rows to each row of shocks, two rows on either side, letting it cure as much as possible, but be sure to have it well set up before rain falls upon it. I prefer letting it stand a day or two in this state, as I have seen it mould some, if the weather should be damp. Then proceed with the remaining four rows in like manner, when each shock shall have received its due portion of 120 hills, be particular to set it upright and even around the centre, and the buts well settled on the ground. Now after the shocks have stood a day or two let two hands go carefully over the whole, righting every shock and stalk that may be out of place, and at the same time firmly tying each and every shock at a reasonable distance from the top with a band made of rye straw, or made by taking four stalks; take off the ears, let each man take two, roll the blades around the stalks from but to top, then let them unite these by crossing their tops and breaking back the tops of each pair towards the but, and inserting the tops between the stalks. Last year I put up about 12 acres in the above manner, a great part of which stood out until May, and better or sweeter corn I never had, than I now have; I think not more than two or three shocks fell so as to take damage. S. T.

Jefferson, Preble Co. Ohio, June 12, 1839.

REPLY TO CHARGES IN DR. PERRINE'S COMMUNICATION.

To the Editor of the Farmers' Register.

Pensacola, July 19th, 1839.

Sir—Your register of June, has an article from Dr. Perrine, of Indian Key, in which are misrepresentations of my conduct. Dr. Perrine showed me a circular from the Hon. Sec. of War, directing all officers on the coast to assist him in his plans as far as possible without detriment to *public service;* at the same time making me a request to procure any mulberry plants that I could find on the mainland and bring them to Indian Key. I

soon after went on an expedition, but did not see any of the morus multicaulis. He also made the same request to Capt. H. Brown, the pilot of my vessel, whose certificate I have obtained. His assertion of my being a partizan of Indian Key is [incorrect.] I never myself disturbed a single mulberry plant, and but one was ever taken up by any person under my command.

Very respectfully,
Your obedient servant,
EDMUND T. SHUBRICK.
Act. Lieut. U. S. N.

[*Certificate.*]

Dr. Perrine requested me at Indian Key to procure him some mulberry plants from Dubose's place at the Miami river. Having met a good many which I took to be the morus multicaulis, I pulled up one to take as a specimen, and which I planted at Soldier Key to preserve it until we next went to Indian Key—and which I did without either the order or knowledge of Lieut. Shubrick. Immediately on our arrival at Indian Key, I informed Dr. Perrine of my having done this. The plant was by accident left. This is what Dr. Perrine terms my confession of having pulled up some large leaved mulberry plants.

HENRY BROWN.

Sir—I request that you will do me the justice to publish this in your next number.

EDMUND T. SHUBRICK.
Act. Lieut. U. S. N.

MILLET.

It is stated in a work on agriculture, that a gentleman in Pennsylvania sowed a peck to the acre the last of May—sowed four acres—cut middle of August, and suffered to dry in the sun for two or three days—produce 75 bushels of seed and one and a half tons of fodder to the acre. Cattle relish it. The produce per acre is frequently much greater than stated above. It is often cut in the milk. It is first sown in drills about three feet apart, and the plants should stand six inches from each other in the rows after hoeing. In this latitude (New Jersey) it may be sown from the middle of May to the 20th of June.—*Corr. Farmer's Cabinet.*

SUCKERING INDIAN CORN.

From the New England Farmer.

The question is repeatedly proposed, is it best to sucker our corn? We believe as a general rule that no growing plant can be mutilated or stripped of its crown, its limbs, or its leaves, without injury; or at least that it cannot be safely done before the seed is completely formed. There are exceptions to this at least of a qualified nature, as where a melon vine is stopped or a grape vine girdled with a view of forwarding the ripening of the fruit. The suckers of corn are of course not so important to the plant as the stalks; and the fodder obtained by removing them will be some equivalent for the labor expended in the operation. But upon the whole we hesitate in advising to it. We once suckered a large field. The growth was most extraordinarily luxuriant and heavy; and a great deal of the corn was broken down by the process. We did not accurately measure the crop, which some accidental circumstances prevented our doing; but as well as we could judge, the amount of produce was not increased, and the whole field was materially injured. We know a careful farmer in Middlesex county, who operating on a small scale and with his own hands, in a case too where the field is so small that he finds no difficulty in carrying out his suckers, who believes that he has derived some small advantage from it. The Rev. Dr. Lyman, of Hatfield, gave to the Massachusetts Society an account of an experiment performed by him, of suckering a considerable field some years since. We have not seen the account for a long time; but as well as we can remember, he regarded the increase of the produce or the saving of the fodder from the suckers as not a compensation for the trouble and the injury to the corn. The fodder from the suckers is not lost if left standing until the whole is gathered. The judgment of Lorain, whose authority in all matters pertaining to agriculture will not be questioned, is against suckering corn, or cutting the stalks until the crop is fully ripened.

In the southern states the leaves of Indian corn are stripped off for the winter fodder of their horses, and as their only practicable substitute for hay. We wish some intelligent southern cultivator, as our respected friend Ruffin, of the Farmers' Register, if this should meet his eye, or the intelligent editor of the Southern Agriculturist, would give us their views on this subject and inform us of any satisfactory experiments which may have been made to test the advantages or the injury of the practice. If opportunity presents, we shall advert to the matter of topping stalks and gathering the crop hereafter; old matters indeed, and on which we have nothing novel to recommend, but in respect to which it may be useful to call to recollection some decisive and instructive experiments which have been made. H. C.

NATURAL HISTORY AND ECONOMY OF THE HONEY BEE.

From the Edinburgh Encyclopædia.

The honey bee is either wild or domesticated, and consists of numerous societies, composed of from 10,000 to 30,000, perhaps 40,000 or 50,000 individuals. In the former state, it inhabits the woods, in clefts of trees, and, it may be, the cavities of rocks also; in the latter, it is kept by us in wooden boxes, or coverings of straw or osiers, commonly called *hives* in English, but more definitely *skeps* in the Scottish language, or old English: for, strictly speaking, *hive* signifies the covering and its colony; and *swarm*, that portion of the bees which leaves the parent stock at a certain season of the year, before it is lodged under our care. Each hive, by which we understand the whole colony, contains three different kinds of bees; females, males, and workers. The females, of which not more than one can ever live in all the great population of a hive, are called *queens*; the males, of which there are hundreds, and some-

times thousands, are called *drones;* and the remainder are denominated *workers*, or *neuters*, from being supposed to belong to neither sex. They are the operative part of the community; for, while the female gives birth to the whole young, and the males perform no functions but perpetuating their race, the workers collect the honey, form the wax, build the combs, watch over the growth of the young, and supply their necessities.

We shall not dwell on the anatomy of the bee, concerning which Swammerdam and Reaumur have so largely written; but the use to which the animal can convert some of its organs, requires a brief explanation of their structure. A bee has four wings and six legs: its abdomen consists of several scaly circular rings, connected by membranes; the last is armed with a sting: and the head is provided with a proboscis, and two mandibles, in addition to a real mouth, which the animal has likewise. The body is totally covered with hair, which is not to be considered an indifferent character; for each separate hair, viewed with a microscope, appears a plant in miniature, with a stem and branches; and the small particles of pollen, shaken off by the motion of a bee in a flower, are arrested by the hairs, and then collected into pellets with its limbs. In the third pair of these limbs is a small hollow, to which the pellets are fixed; and part of the second pair is provided with what resemble brushes, for brushing off the pollen. The proboscis is the principal organ employed in collecting the honey; when inactive, it is folded under the head, and defended by a scaly sheath, or covering. When employed, it is extended, and the animal apparently licks the honey from the flower into its mouth, which is of considerable size, and thence transmits it to the stomach. All the honey which we see in combs is a vegetable product. After being swallowed by the bees, it is disgorged into their cells; but its scanty quantities in the natural state prevent us from ascertaining what change is undergone in the stomach. Until very lately, it was believed that the bees also swallowed the wax, and disgorged it to construct the cells; and, when so disgorged, that it had the property of indurating, like the substance forming silk, immediately on exposure to the air; and that the mandibles were used in moulding the parts to their proper size and thickness. It is now proved, that wax is made out of honey, which is swallowed by the bees indeed, but there is great reason to believe that it then transudes through the membranes connecting the rings of the body in the form of wax. The females and workers have a sting, of which the males are destitute. This is not a simple sharp-pointed weapon, as apparent to the eye of a superficial observer; it consists of two separate portions, applied longitudinally against each other. The external side of each is provided with several barbs, like those of a dart, which prevents the retraction of the sting from the wound it has inflicted, until the purpose of its penetration, the discharge of poison, be fulfilled. These barbs, it is said, may be elevated and depressed at the will of the animal. Having satisfied its vengeance, the sting is withdrawn; but if the bee is suddenly forced away, the barbs remain elevated, and retain the sting in the wound. The extraordinary pain attending so small a puncture, arises from a liquid, which is genuine poison, flowing into the wound from an oval bag, or reservoir, in the body of the animal, connected with the sting; and its virulence is such, as even to accasion death, if the stings be numerous. In experiments where a small portion of the poison was introduced into a slight puncture with the point of a pin, acute pain followed; and, on laying the smallest quantity on the tongue, a sweetish tase first was sensible, which became burning and acrid, and continued so several hours. The effect of the poison is various on different people; in some, a single sting occasions violent swelling and inflammation; others suffer little inconvenience from it. If the sting be left in the wound, its vital powers will force it still deeper; therefore it is cautiously to be extracted, and the part sucked and washed with vinegar, or some liquid fit to allay inflammation, that being probably the only effectual mode of cure. We cannot readily ascertain the real use of the sting to bees. It is vain to affirm, that it is an organ of defence against enemies; that the treasurers of a hive are particularly exposed to depredation, and require great protection. Many other insects, in similar circumstances, have no defensive weapon; many possess it which we can hardly say have any thing to guard; and some, exposed to numerous accidents, are entirely unprovided with the means of averting them. The sole purposes to which we see the sting applied, independent of the resistance of injury, are massacreing the drones of the hive; and by queens, to effect their mutual destruction. Queens are more pacific than the common bees, and less inclined to sting the person that handles them.

The three kinds of bees inhabiting a hive are all of different size and appearance, and may easily be recognized. The common bees and males are familiar to every one; the latter being much larger, and of duller flight. But the queen resembles neither in structure; she is about eight lines and a half in length, while the males are seven, and the workers six. Her abdomen is greatly longer in proportion, and increases much when filled with eggs; her wings are so short as scarcely to reach past the third ring, and her color tends to a deeper yellow. Queens, and also males, are occasionally seen of smaller size than usual; which naturalists have supposed is owing to accidental circumstances. It is not yet known, however, whether all the bees preserved in hives, in different countries, are exactly of the same species; or, whether there are varieties preserving their peculiar characteristics of size and color.

Long ago it was ascertained, that the welfare of the queen is indispensable to the welfare of the hive, and that any accident befalling her, is fatal to the whole colony. As she is the parent of the hive, it is from her alone that a complete swarm, composed of queens, drones, and workers, can proceed; and without all these different members of the community, it cannot either lay up stores, or be preserved in existence. That bees are propagated by means of eggs, which are hatched into worms, could not be unknown from times of the most remote antiquity; but no point in the natural history of animals has been more keenly contested, than their precise mode of generation. It was concluded, from finding males and females together in the same hive, that their sexule union gave birth to the young; yet no one had beheld their concourse. Those provided with the means

best adapted for observation, could only assert, that something like an indistinct and transient junction had taken place before them. Others, again, with with all the assiduity, care, and attention they were able to command, could see nothing of the kind; and thence inferred, that the queen was a real hermaphrodite, which in itself possessed the generative powers of both sexes combined. A third class, where we are surprised the name of Swammerdam should appear, ascribed the impregnation of the queen to a certain *aura* emanating from the bodies of the males, which must necessarily be numerous, in order that it may have sufficient power; and a few observers conceived, that external fecundation of the eggs took place after being deposited in the cell, in the same way as the generation of frogs and fishes is effected. But, on the other hand, young were found in hives provided with queens, though entirely destitute of males. They were seen in spring long before males begin to exist, and in winter after the whole are destroyed; and an experiment by Hattorf evinced the aversion of queen to drones, rather than an affection for them. He took two virgin queens from their cells, and confined each, along with two drones taken from the same hive, under a glass vessel. One of the drones having approached a queen, was seized by her, and killed on the spot; and the other did exactly alike with one of her companions; the two remaining drones escaped. This experiment, on frequent repetition presented similar results; and the variety of devices to ascertain the fact, were attended with consequences which served still more and more to perplex the observer. At length, however, the truth seems to be disclosed, and we shall briefly advert to the methods adopted for the purpose of discovering it.

M. Huber of Genava, one of the most intelligent authors who have written on this subject, finding the experiments of all former naturalists unsatisfactory, removed the whole reigning females from a number of hives, and substituted for each a queen taken at the moment she came to maturity. He then divided the hives into two classes; and have removed all the drones from those of the first class, he adapted a glass tube to the entrance so narrow that no drone could pass, but large enough to admit common bees. The whole drones were allowed to remain in the hives of the second class, and more were even introduced. A glass tube, also, too small for their exit, though of sufficient capacity for common bees, was likewise adapted to the entrance of the hives. This experiment was carefully made; and, to the author's great surprise, all the queens remained steril; thus proving, that a female confined to her hive would continue barren while amidst a seraglio of males.

The result of successive experiments, diversified in every possible manner, and made with much skill and indefatigable labor, proved, that the generation of bees is effected by the union of the sexes, as in most other species of insects, and the larger terrestrial animals. But it is never in the interior of the hive that it takes place. The queen, to accomplish it, must issue forth from her dwelling—the only occasion, except one, on which she leaves it; and although her junction with the drone has not yet been witnessed by human eyes, it is supposed to happen high in the air. In illustrating the generation of bees, the author whom we have already named concluded, that if queens were obliged to go out for impregnation, it would be at the warmest time of the day, as the males then leave the hive. On the 29th of June, a hive, containing a virgin queen five days old, was made the subject of observation. The sun had shone from his rising; the air was very warm; and, at eleven in the forenoon, the males began to leave the neighboring hives. The entrance of the one containing the queen was then enlarged, and the bees entering and departing narrowly observed. The males appeared, and immediately took flight; and soon afterwards the young queen came to the entrance. Before quitting the board, she traversed it, and brushed her belly with her hind legs, during which she received no attention either from the males or workers. Taking flight, she again approached the hive, as if to examine the place of her departure, that she might recognize it. Next, describing circles ten or twelve feet above the surface of the earth, she rapidly rose in the air, and was soon out of sight. The observer and an assistant hastened to contract the entrance of the hive, and in seven minutes the young queen returned. No external marks of fecundation being visible, she was allowed to enter the hive. In a quarter of an hour she came to the entrance, and brushing herself as before, took flight. Returning to examine the hive, she departed, rising so high that the observers soon lost sight of her. Twenty-seven minutes elapsed before her second excursion terminated; but now she was in a very different condition from that in which she appeared after the first; for she exhibited the most unequivocal evidence of sexual union, by bringing along with her the genital organs of the male by which she had been impregnated. And here a wonderful deviation from the ordinary laws of nature ensues; the male loses his organs in copulation, and thus sacrifices his own life in perpetuating his race. In two days the belly of the queen was swollen; and, on investigation, she proved to have laid nearly an hundred eggs in the workers' cells. For some reason, which is unknown to us, the sexual union cannot be accomplished in the hive; and the object of the queen's departure being once fulfilled, she never again leaves it unless to conduct a swarm.

Forty-six hours after impregnation the queen begins laying eggs, which will become workers; and, provided impregnation takes place within the first twenty days of her existence, thousands are produced uninterruptedly during the succeeding eleven months. Then she commences laying eggs which will be drones. But should matters be otherwise arranged; should her impregnation, either from constraint or accident, be delayed more than twenty days beyond her own complete metamorphosis, a singular alteration takes place. She begins laying within forty-six hours of its occurrence, but no eggs excepting those from which drones proceed; nor will she lay any other kind during her whole life. A nice and difficult problem thence arises, which analogy does not aid us to solve. How is the order of nature so completely inverted by retarded impregnation? The eggs producing males require, in the natural state, eleven months to attain maturity; but, under the effects of this accidental occurrence, they reach perfection in forty-six hours. Those eggs which

should have preceded them, during eleven months, in many thousands, totally disappear, and from no other sensible cause. Some vitiation has ensued, which, while it destroys the vitality of which the workers' eggs are susceptible, operates such a change, as to bring those of the males eleven months earlier to maturity. On reflecting that a simple copulation is sufficient to impregnate all the eggs which a queen will lay in two years, or, perhaps, the whole that she will lay during her life, the question becomes still more embarrassing. Without being aware of the cause of such peculiarities, some observers have maintained, that there were certain species of queens, from which no description of bees, excepting drones, would be generated; which they justly determined was extremely injurious to their respective colonies.

The laying of a queen is retarded, or altogether interrupted, by cold; and one impregnated in the end of October has been known to retain her eggs four months and a half, owing to the intervention of winter. This queen, during March and April, laid above 3000 eggs, producing males only; and so very prolific are these insects, that a single queen may be the mother of 12,000 bees, or more, in the space of two months, which is laying at the rate of 200 eggs daily. The queen before depositing an egg, examines whether the cell is clean and fit to receive it, and also suitable to its future state; for queens, males, and workers, have cells peculiarly adapted to their kind, and the queen, by anticipation, seems aware which of these will proceed from the egg she deposites. Those producing workers are deposited in common horizontal cells; but the cells containing the eggs which will be transformed into queens are large and rudely constructed, with a great quantity of wax, and hang perpendicularly in the hive. When the egg is laid, the bees supply the cell with the pollen of flowers, which serves to feed the young worm coming from it.

The eggs of all the three kinds of bees are hatched in three days; a fact apparently of trifling import, but which it is essential for the cultivator to learn. A worker then remains five days in the vermicular state; a male six and a half; and a queen five. The workers' worm occupies thirty-six hours in spinning its silken envelope or cocoon; in three days it changes to a nymph; and only on the twentieth day of its existence does it become a complete or perfect winged animal. The drones are still longer of attaining their last metamorphosis, which succeeds in twenty-four days after the egg has been laid. But the queen comes to perfection in sixteen days.

Food is carried by the bees to the worms as they require it: but when ready to transfrom to a nymph, they are aware that it is no longer necessary; on the contrary, the mouth of the cell is sealed with a covering of wax formed of concentric circles from the edge, convex if including males, and flat if including workers. The same cell may successively bring different workers to maturity: after one has left it, the bees clean the inside, and the mother again lays there; but the cells containing eggs which become queens are used no more than once. When the perfect insect escapes, the cell is usually destroyed.

While treating of the origin and imperfect state of bees, we cannot omit observing, that although, generally speaking, the queen is the parent of the whole, yet there are some workers, (at least some bees so much resembling workers, that there is no perceptible difference,) which lay eggs. Their ovaries are smaller, more fragile, and composed of fewer oviducts than those of queens; and the eggs, like the eggs of queens whose fecundation has been retarded, produce male bees only, and neither queens nor workers. This singular fact, added to another not less so, on which we shall immediately make a few remarks, strongly tends to establish, that all working bees are originally of the female sex; and that in the ordinary case their ovaries are vitiated, and become unfit for laying any eggs except those transforming to males.

M. Schirach, an eminent naturalist, discovered, that in certain circumstances the animal destined to become a worker could actually be converted into a queen; and that this conversion was in the power of the bees, by means of a particular mode of treatment bestowed on the worm while in an early stage. He thence concluded, that every queen is originally a worker, which, without the particular treatment administered, would have remained a worker, but having undergone this treatment, it is converted to a queen; and that the bees, to attain the conversion, selected the worm when three days old. Nevertheless it is indubitable, that specific eggs are laid in royal cells and hatched into queens, which, according to the most credible and satisfactory experiments, never would have produced workers. It is surely to avoid the fatal consequences which would attend twenty or thirty thousand animals on the loss of a single life, that they have been endowed with such uncommon prerogatives.

Immediately on the loss or removal of a queen, the whole hive is a scene of tumult and disorder: the bees seem to anticipate their own destruction, by the precaution they take to guard against it. Should there be neither eggs nor brood in the combs, they will infallibly perish; their instinctive faculties are lost, they have no object for which their labors are united, they cease to collect honey and prepare wax, and in a short time they disappear and die. But if there be brood in the combs, the industry of the bees continues unabated; for by the proceeding which they follow, they know that their loss will be repaired. Having selected a worm three days old or less, they sacrifice three of the contiguous cells, that the cell of the worm may be formed into one adapted to breed a queen. They next supply it with the necessary food, which is not the common farina, pollen, or bee-bread, on which the young of workers feed, but a peculiar kind of paste or jelly, of a pungent taste, which is reserved for queens alone. A cylindrical enclosure is raised around the worm, whereby its cell becomes a perfect tube with its original rhomboidal bottom; for that part remains untouched. Were it injured, the fabric of the other three cells on the opposite side of comb would be deranged, which would be a needless waste. The cell is still horizontal like the rest in the combs, and thus remains during the first three days of the existence of the worm; but the bees in prosecuting its enlargement, alter its direction, and form it to hang perpendicularly, as all those cells do which have been inhabited by queens. In performing this essential part of the operation, they do not scruple to destroy the worms surrounding the tube, and use the wax of their cells in con-

structing the new part, which they appply at right angles to the first, and work downwards. The cell is then of a pyramidal figure, usually near the edges of the combs; it insensibly decreases from the base, and is closed at the top when the included worm is ready to undergo its transformation to a nymph. When reaching maturity, the seal is broken, and a queen comes forth qualified to fulfil every indispensible function on which the preservation of so many thousand lives depends. Working bees have therefore the power of effecting the metamorphosis of one of their own species, to avert the effects of a loss which would prove the utter ruin of the whole colony.

A question extremely abstruse, and difficult in the physiology of animated existence, here presents itself. Whence does it happen that bees are susceptible of so great a change? and that an animal naturally steril, and possessing certain definite habits and properties, which it is death to interrupt or alter, should be converted into a creature of different figure, uncommon fertility, and endowed with instincts bearing little or no resemblance in the one state compared with the other? Some naturalists have endeavored to seek the cause of this singular fact in the food with which the larva is supplied in its cell. That food, they affirm, is not the same as what is given to the young of common bees, as may easily be discovered by its taste and consistency. It possesses a certain quality which affects the organization of the insect, it enlarges the size, expands the ovaries, and operates the whole alteration. By similar reasoning they endeavor to explain the cause of that fertility, which is at times, though rarely, seen in workers. These workers they suppose to have inhabited cells in the immediate vicinity of royal cells, during the earlier part of their own existence. Particles of the food appropriated for queens having accidentally fallen among what was destined for the common worms, produces a partial change in particular organs; though under its influence the ovaries are but imperfectly expanded, and also labor under a vicious conformation, which unfits them from propagating any eggs excepting those transforming to drones. We cannot subscribe to these doctrines, which proceed from the most intelligent noturalists of the present age, because they are unsupported by experiment. The subject is to us still wrapt in mystery; nor is it to be aided by any fact with which we are acquainted in the generation of animals. Perhaps it affords some reason for believing, that the germs of all animals are of one sex only, it may be of no sex, but possessing organs susceptible, in certain cases, of a different kind of evolution. We are indebted to Schirach for the original discovery of this property enjoyed by bees, which has subsequently been confirmed by other observers.

These being the imperfect stages which bees undergo, and their ultimate transformation being completed, three different kinds, females, mates, and workers, whose offices, nature, and properties, are also different from those of each other, inhabit the same swarm. In common with other insects, they are of a lighter color at the moment of issuing from the cells, and totally covered with hair, which is less abundant on the queen. The quantity of it seems to diminish with their age: it is not known how long they survive, but most probably above one or two years, or considerably more. The queens and drones of smaller size, sometimes found in hives, are regarded as aberrations from the general race. Their nature has not hitherto been fully illustrated; but naturalists have ascribed this diminution to the eggs producing them having accidentally been laid in wrong cells; that their organs are there cramped and confined, and prevented from attaining their due expansion from the smallness of the cell. At the same time, though the eggs producing workers are laid in cells of greater than ordinary size, the reverse does not ensue, and the body is still restrained to its natural dimensions. Schirach obscurely hints his opinion, that the greater length of the queen is owing to the greater length of her cell.

We shall next explain the peculiar office and functions of each species of bees, the queens, drones, and workers, in their perfect state, and show the mutual relation that must subsist among them, in order to ensure the welfare of the community. In the history of other insects nothing more is taken into consideration than a general view of the structure, habits, and perpetuation of the race. But in treating of bees, we have not only to enter on the origin of each variety in a hive, to follow it through its successive stages until gaining perfection, to examine that internal œconomy which the instinct of many thousand individuals regulates; but we have to show the cultivator, who designs converting their labors to advantage, how their nature operates separately as well as combined.

The sole functions of the queen bee are to perpetuate her species; but single and unassisted by the workers, herself and her offspring would perish. Her fecundity is surprising. Swammerdam affirms, that she contains 50,000 eggs; and some authors advance, that she may be the mother of 100,000 bees in one season. In addition to the peculiarities exhibited in her propagating young, she is marked by others of the most conspicuous description. She is watched and attended to; and, to judge from appearances, sheltered and respected by the workers. Groups of them constantly encircle her; they supply her with honey, brush and lick her limbs; whenever she moves, they recede before her; and, according to the united sentiments of all who have studied the nature of bees, pay her what would be called real homage, could we allow them the prerogative of understanding. She is an object of the greatest attachment; her presence inspires them with new instincts, and animates them to labor: the permanent existence of a queen, in short, is the only security of the workers. Excepting when she leaves the hive for fecundation, they cluster around her; and hence some persons have endeavored to impose on the credulous, as having a command or power over bees. It is true that such persons could make a whole swarm follow them from place to place without injury to themselves or the spectator; but the sole secret consisted in their having obtained possession of the queen. The natives of foreign countries are acquainted with this attachment of the workers to their queen, which some years since was exhibited in Britain under mysterious disguise, as Labat, long ago, relates in his Travels. He received a visit from a man who called himself *master of the bees*. "It is certain they followed him as sheep do their shepherd, and even more closely. His cap in particular was co-

vered in such a manner, that it exactly resembled those swarms which, in endeavoring to settle, fix on some branch of a tree. Being desired to take it off, he did so, whereupon the bees settled on his shoulders, his head and his hands, without stinging him or those in the vicinity. All followed him when he retired; for besides those which he carried about, they attended him in legions." People accustomed to handle bees with address, can easily seize the queen, and then, as during swarming, little is to be apprehended from the bees attempting to sting; they are too much occupied in regarding their queen.

Though the queen lays several eggs, which will be successively transformed into queens, only one in its perfect state can exist in a swarm: a plurality seems equally adverse to the intention of nature as a total defect. Hence it follows, that of two coming at the same time into existence, one must die for the welfare of the community. But the charge of accomplishing the destruction of the victim is not confided to the common bees; the queens themselves are entrusted with it. Were it otherwise ordained, dangerous consequences might be the result; for while one group of bees destroyed the first of two queens, another might massacre the second, and the hive being thus deprived of both, would perish. Nature has therefore inspired queens with the most deadly animosity, and the most insatiable thirst for each other's life, which nothing but actual death can appease.

The same intelligent naturalist, M. Huber, to whose authority we frequently recur, gives an interesting account of the combats of queens, part of which we shall abbreviate. In one of his hives fittest for observation, two young queens left their cells almost at the same moment. Whenever they observed each other, they rushed together apparently with great fury, and came into such a position that the antennæ were mutually seized by their fangs. The head, breast, and belly of the one, were opposed to the head, breast, and belly of the other. The extremity of their bodies had only to be curved, that they might be reciprocally pierced with the stings, and both fall dead together. But nature has not decreed that the two combatants should perish in the duel; when in the position now described, they separate, and retreat with the utmost precipitation; and when these rivals felt their extremities about to meet, they disengaged themselves, and each fled away. A few minutes after separating, however, their mutual terror ceased, and they again began to seek each other. Immediately on coming in sight, they again rushed together, seized one another, and resumed exactly their former position. The result of this rencounter was the same; when their bellies approached, they hastily disengaged themselves, and precipitately retreated. During all this time the workers were in great agitation; and the tumult seemed to increase when the adversaries separated. Twice they interrupted the flight of the queens, seized their limbs, and restrained them prisoners about a minute. At last, that queen which was either the strongest or the most enraged, darted on her rival at a moment when unperceived, and with her fangs took hold of the origin of her wing, then rising above her, she curved her own body, and inflicted a mortal wound. She withdrew her sting, and likewise quitted the wing she had seized: the vanquished queen fell down; dragged herself languidly along; and her strength declining, she soon expired. Another experiment, equally interesting, on the mutual antipathy of queens, elucidates the instinct of the common bees, and seems to prove that they are aware of the necessity that such combats should have a fatal issue. M. Huber having painted the thorax of a queen, on purpose that she might be recognized, introduced her into a hive already provided with the natural queen. A circle of bees quickly formed around the stranger, but not to caress or receive her with that grateful homage which a queen is wont to experience; on the contrary, they insensibly accumulated to such a degree, and encompassed her so closely, that scarce a minute elapsed before she lost her liberty, and became a prisoner. By a remarkable concurrence, the workers at the same time collected around the reigning queen; and restrained all her motions: she was instantly confined like the stranger. But as if the bees anticipated the combat in which these queens were about to engage, and were impatient to witness its issue, they retained them prisoners only when preparing to withdraw from each other; and if one less restrained seemed desirous of approaching her rival, all the bees clustering together gave way, to allow her full liberty for the attack: then if the queens testified a disposition to fly, they returned to enclose them. These facts form a singular anomaly in the history of bees. That they take a decided part on the occurrence of such combats, is indubitable; but if they mean to accelerate them, how shall we account for the uncommon care and attention, on every other occasion, bestowed on their queen, be now forgotten, and for their opposing her preparations to avoid impending danger? The cluster of bees that here surrounded the reigning queen having permitted her some freedom, she appeared to advance towards that part of the comb on which her rival stood. All the bees receded before her: the multitude of workers between the adversaries gradually dispersed, until only two remained: these also removed, and allowed the queens to come in sight. At this moment the reigning queen rushed on the stranger, and fixing her against the comb, mortally pierced her body with her sting.

The mutual antipathy manifested by queens, is not limited to their perfect state, for it extends to nymphs yet in the cells. The future existence of a rival, which may dispute her place in the hive, seems to excite apprehension in a queen already come to maturity. The oldest queen in a hive containing five or six royal cells, having undergone her ultimate metamorphosis, hastened, within ten minutes of escaping from her confinement, to visit the cells of the rest still close. She furiously attacted that nearest to her, and, by dint of labor, succeeded in opening the top: then she began tearing the silk of the cocoon; but her efforts being probably inadequate to her purpose, she sought the other end of the cell, where she effected a larger aperture. When of sufficient size, she endeavored to introduce her belly; and after many exertions, succeeded in giving her approaching rival a deadly wound. When she left the cell, the bees, which had hitherto been spectators of her labor, began to enlarge the opening, and drew forth the body of a queen scarcely come from the nymphine

state. Meanwhile the victorious young queen attacked another royal cell; but did not endeavor to introduce her sting: it contained only a nymph, and not a perfect queen as the former did. Hence it has been conjectured, that the nymphs of queens inspire less animosity: still they do not escape destruction, for whenever a royal cell is opened before its proper time, the workers extract the contents in whatever form they appear, whether worm, nymph, or queen. Accordingly when the young queen had here abandoned the second cell, the opening which she had made was enlarged by the bees, and they extracted the included nymph. Nymphs of other hives, introduced into one where there is a queen, are equally the subject of animosity. But in this general work of destruction, there is a fact, in the natural history of bees in their earlier stages, elucidated, which we should otherwise find it difficult to explain. The larvæ of the whole three species are endowed with a property widely diffused among insects, that of spinning silk. Each, as we have before observed, spins itself a web or cocoon, in which it reposes a certain time inactive, previous to transformation to the perfect state. The larvæ of workers and males, spin complete cocoons close at both ends; the cocoons of queens are imperfect, covering only the head, thorax, and first ring of the abdomen. Nor can the larvæ do otherwise; the particular form and position of the cell force it to leave the ends of the cocoon open, while in the natural state; but if removed from it, and situated in the same circumstances as the larvæ of males and workers, a complete cocoon is fabricated, in which the animal is fully enveloped. But the purpose of the open cocoon is only now to be discovered; it is, that the enclosed nymph may be exposed, without resistance, to the deadly jealousy of its rivals. Were it close, the sting of the queen, which seems never to be used excepting to destroy her own species, might be entangled in the silk, by which she herself might become the sacrifice, and occasion the loss of the whole hive.

Though only a single female can exist in a swarm, several hundreds, and sometimes thousands, of drones inhabit it. They originate towards the summer season, eleven months after the queen has commenced laying those eggs that become workers, that is, when the propagation of the colony takes place. The sole office of the drones, so far as has yet been discovered, is to fecundate the queen; for we can scarely admit, as several authors have done, that their heat and custom of crowding on the combs is instrumental in hatching the young brood. Concerning the structure of the genital organs, which are extremely complicated, we shall refer to the works of Swammerdam, Reaumur, and Huber, who have expatiated on it at great length. Drones want a sting; and there is a difference in the conformation of several other parts of the body, as the trunk and antennæ, from those of females and workers. They do not collect honey, but consume it; and instead of entering the cells, as the females and workers do, for repose, they cluster together on the combs. If the sole office of drones be to fecundate the queen, we cannot well account for their numbers. Why should thousands dwell in a hive a burden on the community, when one is enough to perpetuate their race, and when only a single impregnation is required? Naturalists, who have ascribed the fecundation of the queen bee to a certain *aura* emanating from the males, judged it essential that they should be in numbers, that the *aura* might have sufficient power or intensity. Those observers, again, who have demonstrated, that impregnation is operated without the hive, deem it necessary that the drones should be numerous, otherwise the queen would have little chance of meeting any one in her course through the air: and others, even the most acute persons, who allowed themselves to believe, that here the solicitation was on the part of the female, thought that this redundancy of maleswas given, in order that she might make her choice. These reasons are to us alike unsatisfactory: the first, from its being utterly adverse to the laws which regulate the preservation of animals; the second, from resting on no surer basis than on simple conjecture, still unsanctioned by evidence; and the third, from being a conclusion on facts which never happen. Nevertheless it is unquestionable, that a hive, deprived of drones, will produce no young, though we cannot form an idea of the precise number necessary for the ends of generation.

After a particular period of the year, when the queen has been impregnated, and when the masculine properties of the drones are no longer of any use, they are mercilessly destroyed by those very workers which once watched so carefully over their origin. This is a fact well known, and has given birth to various hypothesis. In Britain, as in other countries, the period of the massacre probably depends on the advancement of the season, and always happens during the autumn months. The drones then flying from destruction, are seen on the flowers, occupying the panes of our windows, or wandering about from hive to hive, which they no sooner enter than death awaits them. This incident occurs sooner on the continent, where the seasons are earlier, compared with ours; and we shall cite the substance of some observations by a Swiss naturalist, by which it is materially illustrated. "It is usually in the months of July and August that the bees free themselves of the males. They are at that time driven away and pursued to the inmost parts of the hive, where they collect in numbers: and as many are then found dead on the ground, it was to be concluded that, after being expelled the hive, they are stung to death by the bees. Yet, on the surface of the comb, the sting is never observed to be used against them; the bees seem satisfied with pursuing and chasing them away. To ascertain the truth, we thought of getting the support of the hive made of glass, and of placing ourselves below, to discover what passed in the scene of action. A glass table was therefore constructed, on which six hives containing swarms of the same year were put, and lying under it, we endeavored to see in what manner the drones were destroyed. Our contrivance succeeded to admiration: on the 4th of July, we saw the workers actually massacre the males in the whole six swarms, at the same hour, and with the same peculiarities. The glass table was covered with bees full of animation, which flew on the drones as they came from the bottom of the hives; seized them by the antennæ, the wings, and the limbs; and, after having dragged them about, or, so to speak, after quartering them, they killed the unfortunate victims by repeated stings, directed between the rings

of the belly. The moment that the formidable weapon, with which the workers are armed, touched them, was the last of their existence; they stretched their wings and expired. At the same time, as if the workers did not consider them so completely dead as they appeared to us, they struck the sting so deep that it could scarcely be withdrawn. Next day having resumed our position, we witnessed new scenes of carnage: during three hours the bees furiously destroyed their males. On the preceding evening they had massacred all their own; but now they attacked those which, driven from the neighboring hives, had taken refuge amongst them. We saw them also tear some remaining nymphs from the combs: they greedily sucked the whole fluid from the abdomen, and then carried them away. The following days no drones remained in the hives."

The cause of this cruel extirpation of so great a portion of the community, is very far from being evident. It is not enough to say, that it is from the drones being no longer of any use in propagating the species; or that their numbers would be a burden on the rest, seeing they are altogether inefficient. Conclusions deduced from either of these reasons, are not to be admitted in our present state of knowledge respecting the natural history of bees. Probably, however, our attention should be directed to the consequences of the drones having fulfilled the purposes of generation; for they are never destroyed in hives wanting queens, nor in hives where queens lay eggs producing males only. In both situations they are tolerated and fed, and may be seen living in perfect security throughout the winter. The massacre happens in those hives alone possessing queens completely fertile; but never until the season of swarming has elapsed.

In considering the nature of the individual species of bees inhabiting a hive, an acquaintance with which, we repeat, is indispensable before converting their labors to use, we have to notice some of the peculiarities exhibited by workers. It is to this great class that the welfare of a hive properly belongs: without their incessant aid, the males, females, and even the brood itself would quickly perish; and if the presence of a queen be essential to their safety, they are no less requisite for her preservation.

Certain facts, we have already remarked, tend to establish, that all workers are originally females; and in most, perhaps in every hive, some are found laying eggs, which will be future drones. But here viewing them as a large class of the community, consisting of twenty, thirty, nay forty thousand individuals, we behold them employed in various purposes, extremely diversified, for the general good. They are charged with cleaning and preparing the cells appropriated for their embryos of their own kind, of the queens, and the males: they collect the honey, obtain wax, and build the combs: likewise, they gather a particular substance, (resinous, as is supposed) with which all the crevices of the hive are closed, and its inside covered. After the queen has deposited her eggs, the workers supply the food adapted for the worms of each species, and regulate the proportions, so as to serve until the last metamorphosis is undergone: and they seal every cell with a covering, different, according to the different worm included, at the proper and appointed time. Nor are these the limits of their occupations; while some guard the queen, construct the combs, and watch over the necessities of the young, others keep constant watch, day and night, at the entrance of the hive: if a stranger bee, a wasp, or noxious insect appears, it is instantly repelled or destroyed: even should a queen, which, on usual occasions, is treated with such unequivocal marks of regard, be introduced to the hive of any swarm but her own, the workers immediately seize and restrain her, and, without being wounded with their stings, the confinement she suffers is such, that she sometimes dies of absolute suffocation.

All the operative parts of the œconomy of the hive are entrusted to the workers; and as the collection of honey and combs which they construct are the substances converted to our use, and indeed is the main purpose of our cultivating them in numbers, it is proper that we should elucidate the manner in which this is effected. Honey is a vegetable secretion, which appears at different seasons of the year, especially when flowers in general blow. We can readily understand how it is stored up by the bees: they lick it with the proboscis from the flowers; it is swallowed; and on their return to the hive, it is disgorged, not from the trunk, but the mouth, into the cells. Only a small portion is collected by each, but the united labors of thousands produce an abundant harvest. Reaumur has calculated, that within an hour 3000 bees have returned from their collections to a hive, whose population did not exceed 18,000; and in six days, Swammerdam, if we rightly understand his expressions, found nearly 4000 cells constructed by a new swarm, consisting of less than 6000 bees. Some of the cells filled with honey are destined for the daily consumption of the bees, and others are sealed up and reserved for times of necessity. Many of the laborers free themselves of their collections before reaching the cells, by bestowing them on their neighbors; the trunks of latter are seen extended, and they receive the honey with them as it is disgorged.

Honey being a vegetable product, its properties depend entirely on the nature of the plants from which it is collected: one kind is of the finest flavor, delicious to the taste, pure and transparent; another is entirely of a different consistence, dark, greenish, tenacious or bitter; and a third has been known to produce deleterious effects, which were almost, if not completely, fatal to human life. Dioscorides, Pliny, and various ancient authors, speak of honey in the east being dangerous in certain years; and Xenophon relates, that when the army of ten thousaud approached Trebisond, the soldiers having partaken copiously of honey found in the neighborhood, were affected like persons inebriated; several, on whom it had more violent consequences, became furious, and seemed as if in the agonies of death. Though none of them died, all were extremely weak for three days. In recent times, we are told of the pernicious effects of a particular kind of honey collected in America; and plants grow in the Archipelago, the honey of which is said to occasion vomiting. Thus Don Felix Azara informs us, that there is a particular kind of honey collected in Paraguay, called *cabatatu*, which occasions a severe headach, and produces as perfect intoxication as ensues from brandy; while another kind brings on convulsions, attended with the most excruciating pains, which last thirty hours.

Bees are seen laden with a yellowish substance in very considerable quantities, which also is stored up in the hive. This is not wax, as is commonly supposed, but either the pollen of flowers, which is used for feeding their young, or propolis for stopping the crevices of their dwelling. The combs are constructed of wax, which owes its origin to honey: or it may be formed from sugar, the saccharine part of which constitutes one principal ingredient of honey. Naturalists have adopted many conjectures concerning the mode in which it is elaborated by the bees. In general they supposed that the yellowish pellets adhering to their limbs were swallowed, and afterwards disgorged as wax in a state of purity. The process is still obscure, but recent experiments seem to afford reason for believing that it may transude between the scales of the abdomen; and the appearance presented by wax on such places led former observers to affirm, that it was collected there instead of on the limbs. It is established by satisfactory experiments, that, whatever be its issue from the body of the bee, it originates from honey. Mutual relations subsist in their elementary principles, and the one is dependent on the other. Those years unproductive of the honey are also unproductive of wax; and we often see swarms which begin their collections with the most promising appearance, still make but little progress, and terminate with acquiring too small a quantity of honey for their future subsistence. In these cases, wax is sparingly provided also. What led to a narrow investigation of the preparation of honey from wax, was a naturalist observing that bees continued carrying quantities of the yellow pellets or pollen into hives quite full of comb, and where there was no room to construct more; and on the other hand, that they enlarged the combs of hives containing only a small portion, and did so without carrying in the pellets at all. Succeeding experiments proved that the pollen which they collect from the antheræ of flowers, is used solely for feeding their young, being the same which, in ordinary description, we call farina, or bee-bread; and that they will take it grain by grain in their teeth, to transmit it into the mouths of the larvæ: a remarkable trait of patient industry. In ascertaining the mode by which wax was produced from honey, M. Huber confined a swarm of bees in a straw hive to an apartment, along with a quantity of honey and water necessary for their subsistence. The honey was exhausted in five days, and five combs of the finest snow-white wax were then found suspended from the arch of the hive. Lest this might have been the produce of the farina carried in by the bees when their confinement commenced, all the combs were removed, and the imprisonment of the bees repeated. But the result was the same; they formed other five combs of the finest and whitest wax. It is the saccharine part of the honey which produces wax; and bees supplied with equal portions of honey, and of sugar reduced to a syrup, produce a greater quantity of wax from the latter. From a pound of refined sugar reduced to a syrup, and clarified with eggs, a swarm of bees produced ten drams and fifty-two grains of wax, darker in color than what they extract from honey: from a pound of dark brown sugar, they prepared twenty-two drams of very white wax, and the like from the same weight of sugar from the maple. Wax is produced sooner, as well as in greater proportion, from sugar than from honey; and the darker the sugar, the finer is the wax. Repeated observations prove, that the secretion of honey in flowers is powerfully promoted by the electricity of the atmosphere; and bees never labor more actively than during humid sultry weather, and when a storm is approaching. Sometimes the secretion of honey is entirely suspended by the state of the weather, which occasions a total interruption of the labors of the bees; and if this be too long protracted, a populous hive may actually die in the midst of summer. The odor exhaled by the hives, and the size of the bees, are always certain indications whether the flowers contain honey. When numbers of bees return from their excursions with the belly thick and cylindrical, it shows they are gorged with honey; and these are exclusively the workers in wax. The belly of those performing the other functions, always preserves its ovoidal form, and does not sensibly increase in size. Although the flowers be destitute of honey, bees still are able to store up quantities of farina or pollen necessary for feeding their young. Part of it is immediately given to them, and, as is affirmed, what is superfluous is reserved in cells. Sixty-five hives, the whole of which exhibited workers in wax, were examined on the 18th of June, when the country was covered with flowers, and while the bees actively pursued their collections. Those returning to old hives, having no cells to construct, deposited their honey in the combs, or gave to their companions; but those of new swarms converted their honey into wax, and hastened to build combs for the reception of their young. Chilly and showery weather interrupted their labors, and the combs received no addition by the construction of new cells. The weather however altered, the chestnut and elm were in flower, and the thermometer on the first of July rose to 77°: the bees resumed their labors with the utmost activity from that day until the 16th, both in honey and wax. But thenceforward no honey being produced, they collected quantities of pollen only; and the odor of the flowers showed there was nothing excepting an inconsiderable secretion of honey at intervals, barely sufficient for subsisting the bees. It was found, on examining the sixty-five hives in the end of August, that, after the middle of July, the bees had ceased to work in wax; that they had stored up a great quantity of pollen; that the honey of the old hives was very much diminished, and in the new ones scarce any remained; as what was at first collected had been consumed in the preparation of wax. Thus it appears, that, in the natural state, honey is the source of wax, and the food of bees; that its secretion from flowers is affected by adventitious circumstances; and that its qualities are different in different countries. No elementary principles of wax reside in pollen; this substance is collected solely to feed the young contained in hives, and the perfect bees themselves never live upon it.

The propolis is another substance collected from plants, which is extremely useful to bees. Besides the purposes of stopping crevices, covering the interior surface of the hive, the sticks supporting the combs, and glueing the hive to the board on which it stands, bees employ it in greater portions at once. Stranger animals of small size entering

a hive are immediately stung to death, and then dragged by the bees to the outside: there are few persons who have not seen that a dead fly, or bee laid on their board, is quickly carried away and dropped at a distance: it seems the nature of these insects not to endure any filth or corruption in their habitation. Should a larger animal, such as a snail, make its way into the hive, it does not escape; it is put to death, but the bees are unable to divest themselves of its body. Maraldi relates, that he saw the dead body of a snail totally covered with propolis, and thus prevented from spreading infection in the hive; and Reaumur tells us, that a shell snail having fixed itself on the pane of a glass hive, waiting until the moistness of weather should be an inducement for it to move, the bees encircled the mouth of the shell with so thick a bed of propolis, that the animal, unable to moisten it as it moistens its own gluten, was arrested on the spot. The original source of the propolis is not yet perfectly understood: it is much more tenacious, and attains a greater degree of hardness than wax: those bees that return laden with it, owing to its tenacity, experience considerable difficulty, even with the aid of their companions, in divesting themselves of the load. M. Ducarne observes, "several times I have seen bees occupied in collecting, or rather in tearing away with their teeth, the propolis of old hives which I had exposed to the sun; and this appeared so laborious, and the animals pulled so forcibly, that I thought their heads would have been separated from their bodies."

The structure of the cells, which are exclusively the production of the workers, has excited admiration in every contemplative mind; and it is demonstrable, that their figure is the best adapted for containing the greatest possible quantity in the least possible space. A number of cells united constitute the comb, between twelve and thirteen inches square of which, Reaumur calculated, would contain 9000. The primary object of the cells seems to be for propagating the young; after these have gained maturity, they are cleaned out and filled with honey; but there are cells also destined for this purpose from the beginning. The same cells may be employed for several successive broods, and when the whole have come to perfection, they are appropriated for the winter stores: those at the top of a comb are neatest and best made, as well as of better materials, compared with those at the bottom. In the shape and size of the comb, bees are guided by circumstances; a small cavity is totally filled with equal combs, while in one of greater dimensions there may be some large, and others not one-fourth of the size. By a law of nature, from which they seldom deviate, the foundation of the second comb is laid parallel to that of the first, and the successive combs are generally parallel to each other. Sometimes they are seen at right angles, or apparently misplaced, which probably results from accidents having an influence on the earlier part of their construction. There is usually the distance of four lines between each; and should the comb, in its construction, have taken an oblique direction, it is afterwards brought into a more perpendicular line by the bees, which diminishes the vacancy intervening. Combs originate in the top or arch of a hive, and are worked downwards; but should the upper part be removed, it is said the bees will work upwards to fill the cavity. In order to shorten the courses which they would necessarily have to make round the surface of large combs, they open various communications through them, and also open passages between their edges and the side of the hive; at least we are not acquainted with any other purposes of such perforations found in them. The cells composing a comb are of three kinds, corresponding to the three species of bees; but there are considerable irregularities in the structure of all; neither do those of the workers invariably exhibit that perfect hexagonal figure which many persons expect to find. It may appear singular how bees can fill horizontal cells quite full of honey, and yet prevent it from escaping. Perhaps it is partly retained by its own viscosity, and from adhesion to the sides of a tube of such small diameter. Each cell is sealed with a flat covering most ingeniously devised: it is nature, however, that must have done so. A circle is formed around the mouth of the cell, which is gradually diminished by other concentric circles, until the aperture remains a point capable of being closed by a single grain of wax.

Though the hive be amply stored with honey and wax, and the young brood gradually approaching to maturity seems to leave nothing to be desired by the bees, they all of a sudden desert their habitation to go in quest of another. For this incident, which is called *swarming*, there is no ostensible cause, nor do the reasons assigned for it by different observers prove satisfactory in our estimation; for its occurrence is irregular, and its frequency is uncertain. According to common apprehension, swarming ensues from a hive being overstocked with bees, and especially from a young queen seeking a new dwelling. It never takes place, we acknowledge, unless the bees be numerous; but there are so many exceptions, that we cannot say it is from wanting room: and instead of the young queen, it is always the old one that leads out the swarm: nay, should an old queen have conducted a swarm of this year, she will also be found at the head of the first which next year leaves the hive. Each subsequent colony departing is led by a young queen. An old queen never leaves her hive until she has deposited eggs which will become future queens, nor until her principal laying of the eggs producing drones is over; the common bees construct royal cells only, while she lays those eggs which will be transformed to drones; and after this laying terminates, her belly being more slender, she is better able to fly; whereas it is previously so heavy and surcharged with eggs, that she can hardly drag herself along. One chief cause or concomitant of swarming apparently consists in the agitation of the queen. She is suddenly affected, hastily traverses the combs, abandoning that slow and steady progression which she ordinarily exhibits: her agitation is communicated to the bees; they crowd to the outlets of the hive, and the queen escaping first, they hasten to follow her. Commonly the whole take but a short flight, and the queen having alighted, the bees cluster around her. This constitues the new swarm. With regard to the precursors of swarming, there is no infallible guide: those on which observers are accustomed to rely, the most frequently prove fallacious. The general indications given by Reaumur, a naturalist of the first eminence, who draws

his conclusions from facts, and has fallen into few errors, are, first, the appearance of drones in a hive; for no swarm will proceed from one where there are none; secondly, when the bees are so numerous, that part crowd about the outside of the hive, or lodge on the board in clusters of thousands: and thirdly, which is the least equivocal sign of the day of swarming, when fewer bees than usual go abroad for collection, and return without honey or wax. Most observers also affirm, that in the evening before swarming an uncommon humming or buzzing is heard in the hive, and a distinct sound from the queen, called *tolling* or *calling*. Mr. Hunter compares it to a note of a piano forte; and other authors to different tones. This we rather incline to suppose is not an indication of swarming, but a proof that there is a young queen as yet confined in her cell, and that probably the sound proceeds from her. We shall afterwards have occasion to say a few words concerning the power of a queen in emitting sounds, and the wonderful effect which these instantly produce on the whole workers.

In illustrating the concomitants of swarming, we shall again resort to the observations of the naturalist Huber, one of the few investigators of the subject, whose remarks are to be received with implicit credit. After establishing that an old queen conducts swarms, leaving worms or nymphs in the hive, which, in their turn, transform to queens, he availed himself of a favorable season to follow their history in the perfect state.

A young queen being introduced into a hive on the 12th of May, the bees received her well, and she immediately began laying. Twelve royal cells, all situated on the edges of the communications or passages through the combs, were begun on the twentieth, and on the twenty-seventh, ten of them were much, but unequally, enlarged. On the twenty-eighth, previous to which the queen had ceased laying, her belly was very slender, and she began to exhibit signs of agitation. Her motion soon became more lively, though she still continued examining the cells, as if about to lay: sometimes introducing her belly, but suddenly withdrawing it without having laid; at other times depositing an egg in a different position from what it should naturally have. The queen produced no audible sound in her course, nor was any thing heard different from the ordinary humming of bees. She passed over the workers in her way: at times, on stopping, those meeting her also stopped, and seeming to consider her, advanced briskly, struck her with their antennæ, and mounted on her back; and she proceeded thus carrying some of them above her. The bees no longer inclosed and formed regular circles around the queen, nor did they supply her with honey; but she voluntarily took it from the cells in her way. Those which were first aroused by her motions, followed her, running in the same manner, and in their passage excited others still tranquil on the combs. The path she had traversed was evident after she had left it, by the agitation there created, which never afterwards subsided. The queen had now visited every part of the hive, and occasioned a general agitation: if some places yet remained quiet, the bees in motion arrived, and imparted that which affected them. The queen discontinued depositing her eggs in the cells: she dropped them at random; and the workers ceased to watch over the young. They ran about in every different direction: even those returning from the fields before the agitation reached its height, no sooner entered the hive, than they participated in the same tumultuous impulse: they neglected to free themselves of the waxen pellets on their limbs, and ran heedlessly about. At last the whole rushed precipitately to the outlets of the hive, and the queen along with them.

These facts were ascertained with the utmost care, and corroborated by future experiments. On the first of June, all was quiet in a hive at eleven in the forenoon; but at mid-day the queen, from a state of perfect tranquillity, became evidently agitated, and her agitation was insensibly communicated to the workers in every part of their dwelling. In a few minutes they precipitately crowded to the outlets, and, along with the queen, left the hive. After they had settled on the branch of a neighboring tree, the observer sought for the queen, thinking, if she was removed, that the bees would return to the hive: a fact which actually ensued. Their first care then seemed to consist in seeking their female: they were still in great agitation, which gradually subsided, and in three hours complete tranquillity was restored.

Our limits preclude us from entering at sufficient length on this most interesting part of the natural economy of bees, and we must be content with referring to the works of the two celebrated authors already cited. The latter ascribes the chief inducement of those bees conducted by young queens to swarm, to the agitation by which the queen is animated being imparted to them. He endeavors to trace the source of that agitation to the antipathy mutually entertained by the females, which, extending even to those in an imperfect state, is directed against the nymphs lodged in the cells. No sooner does a young queen herself attain maturity, than she attempts to destroy her rivals: but there is a constant guard of workers preserved over them; she is repulsed, maltreated, and driven away. If deserting one cell she approaches another, it is to experience the same resistance; she is actuated by an unconquerable desire to accomplish her object; she is harassed by the incessant opposition of the bees; agitation thence ensues, and she resolves on flight. It is here to be observed, that although experiments prove that the agitation of a queen is communicated to the workers, and though, with regard to young queens, such may influence the bees to swarm, the same reasons will not apply to old queens leading forth new colonies, for what we have above described only belongs to young ones. So long as a young queen remains in a virgin state, she meets with little of that conspicuous respect, care, and attention, which is lavished on her when the bees know she is about to become a mother. She is previous treated with great indifference; and hence arises the resistance she suffers when attempting to destroy the nymphs in their cells, and her consequent agitation. "But the conduct of the bees towards the old queen, destined to conduct the first swarm, is very different. Always accustomed to respect their fertile queens, they do not forget what they owe to her: they allow her the most uncontrouled liberty. She is permitted to approach the royal cells; and if she even attempts to destroy them, no opposition is offered by the bees. Thus her inclinations are not obstructed; and we cannot

ascribe her flight, as that of the young queens, to the resistance she experiences." These observations greatly increase the difficulty of attempting to account for swarming: we acknowledge that here we can find no satisfactory explanation. The old queen, it has been supposed, becomes agitated by the presence of so many royal cells, and at the prospect of the combats in which she has to engage, and she also communicates her agitation to the workers. The agitation of the females excites motion in the workers, which increases their animal heat, and raises the temperature of the hive to such an insupportable degree, that they hasten to leave it. In a populous hive, where the thermometer stood from 92° to 97° in a fine summer day, it rose above 104° during the tumult which preceded swarming.

The extraordinary instinct and precautions so conspicuous in bees, are apparently affected during the period of swarming. We cannot admit, with those observers, who seem more actuated by the love of the marvellous than an exposure of truth, that they are endowed with that prescience which induces them, before their departure, to prepare a place for their reception. On issuing from the hive, bees, so nearly as we can determine, have no object in view; and they often resort to situations the most unlikely, and evidently unsuitable for their convenience or preservation. After rising in the air, it is commonly some tree that arrests their progress, and the queen frequently alights at the unsheltered extremity of a branch, where the bees that may have formed into various clusters in the vicinity, come to surround her. But we have known them repeatedly swarm on the grass, near the hive they had forsaken, notwithstanding trees were at no great distance.

Bees swarm only during the best weather, and in the finest part of the day. Sometimes all the precursors of swarming, disorder and agitation, have been seen: but a cloud passed before the sun, and tranquillity was restored.

If a hive swarms oftener than once, the new swarms consist of those bees that have been abroad when the first event took place, added to young ones come from the eggs, laid by the queen before her departure. Each is led out by a young queen, as there are usually several royal cells in a hive: but the bees can prevent the whole queens nearly of an equal age from leaving their cells, though come to maturity: and when they do liberate them, it is according to their age, which they have some secret means of ascertaining; for the oldest are invariably liberated first.

The young swarm, whether removed from the place where it settles or not, begins to work; cells are constructed of wax from the honey the bees have carried along with them; and nature has so arranged it, that the first eggs laid by the queen produce the operative part of the community.

ON THE USUAL CARELESSNESS IN SAVING SILK-WORMS' EGGS.

To the Editor of the Farmers' Register.

Stafford, August 5th, 1839.

I am highly gratified that you have given the agricultural community a caution about silk-worm eggs. At least two-thirds of the failures in rearing silk-worms in this country may with propriety be attributed to bad eggs. Many persons raise silk-worms for the *sole* purpose of speculating on the eggs, and are probably not aware of the necessity of careful management to procure good eggs. Prevailing thoughtlessness on this subject, which I know exists extensively, if not checked, will throw serious obstacles in the way of this important culture, which I firmly believe is destined to repopulate the poor land districts in Virginia and Maryland. I will add a caution which may be of service to the inexperienced. If the cocoons intended for seed are thrown into a heap, and permitted to remain for several hours, when the weather is warm, the eggs produced will generally be worthless. I know this to be the fact from dear bought experience.

"When silk-worms are to be raised, the eggs to be procured from the cocoons, must be thought of before any thing else. Now-a-days when the cocoons are collected, it is the custom to keep them altogether upon the frames. Some persons not having time to reel all their silk, butterflies are seen to go out and lay eggs almost immediately. The accumulation of cocoons produce a kind of fermentation, and the heat causes the butterflies to hatch before the proper period. This premature developement has never any good results, for the butterflies are sick; and from thence it comes that the silk-worms produced from their eggs, are affected by diseases from the moment of their hatching.

"The cocoons for reproduction ought to be separated, *and put in a well aired chamber*, and spread upon very clean mats, *a layer of the thickness of a single cocoon only*." *(Chinese Treatise, published by P. Force, p.* 150.)

I have about 40,000 silk-worms of seven varieties. They are remarkably healthy, and a large portion of them spinning in handsome style. In September I will furnish you a meteorological record, with explanating remarks.

Respectfully yours,

LAYTON Y. ATKINS.

P. S. There is no advantage to be derived from a forced and premature developement of the silk-worm in any of its stages. The nearer the time of spinning to the natural period of its life, as stated by Dandolo, the better. The *precocious* and the *tardy* are always feeble, and eggs should never be saved from them. I have made nine rearings of the "two-crop" white, and of the cocoons formed between the 25th and 30th days it has required from 700 to 800 to weigh a pound, and so of the last which spin; but of cocoons formed from the 30th to the 35th day, 350 to 400 to make a pound. Depend upon it modern writers on silk-culture are promulgating a pernicious error on this point; and before the learned *silk-worm* doctors publish any more *infallible* prescriptions, I advise them to put on their spectacles and bring their remedies to bear on four or five cases.

If a *forced* and premature developement is so important what reason or sense would there be in the following passage from the Chinese Treatise:

"The moths which come out the first day are called *grass moths*. The last of all are called *mogno*, (that is to say, the last butterflies.) *Neither* of these ought *to be kept*."

Mark the care of this people about procuring

eggs. Cocoons are first selected, and when the butterflies come out, the *first* and the *last* are rejected. Let the people of the United States make numerous and careful experiments. We *beardless* boys of Virginia at least, do not mean to open wide our mouths and swallow nostrums as an unfledged bird does its food. L. Y. A.

COPPER MINE IN NORTH CAROLINA.

To the Editor of the Farmers' Register.

Williamsburg, 15th August, 1839.

I take the liberty of sending you the following advertisement, taken from the 'Virginia Gazette,' printed in this city for William Parks, 16th February, 1738. It is possible that it may not be known at this time, that there is a copper mine in North Carolina; if so, the fact may benefit some individual, and perhaps our country. The information is given for your use, by your friend,

RICHARD RANDOLPH.

"To be sold by Charles Evans, ferry keeper on Tar River, 15 miles from Speece's ferry on Roanoke river, in North Carolina, at ten pounds, Virginia currency, per hundred, 2000 acres of very good land, being purchase land, granted in the proprietor's time, at six pence per hundred quit-rent forever; and in the banks thereof, is a copper mine, twice tryed in England. It runs five miles on the river, is very commodious for trade, with two cypress swamps thereon, and near adjoining to a desart, called the Canetar, supposed to be 10 miles wide, and thirty miles long, and there is brave hunting the bear. CHARLES EVANS."

The foregoing advertisement is not sufficient proof of the existence of copper ore, at least in profitable quantity. From one of the old manuscript journals of Col. William Byrd, (which curious and interesting records of old times we hope to be enabled hereafter to publish,) it appears that there was formerly a copper-mine mania raging along the borders of the upper Roanoke, which has since passed away, leaving no known trace of its existence, save what is presented in his journal and this old advertisement.—ED. F. R.

"THE DEBT-PAYING NATION."

From the Genesee Farmer.

This is the name which the United States have acquired abroad, and never was an appellation better deserved. We, as a nation, run in debt more to others, than perhaps all other nations put together. What would be said if Great Britain should run in debt two hundred millions to France, or Prussia fifty millions to Austria. We, on the contrary, think nothing of selling our credit to the amount of a hundred or two of millions, in the shape of stocks, and then purchase goods annually to the amount of some twenty millions more than we can pay at the time, trusting to luck, and tempting Providence. It requires no prophetic sagacity to foretell that matters cannot always go on at this rate. Our credit must be over-taxed in time, and though our resources are immense, a sudden invitation to 'hand over' would produce a convulsion, of which we who remember 1837, may form a faint conception; a convulsion in which the credit and the floating capital of the country would alike go to ruin. The individual is on the high road to bankruptcy, whose average expense exceeds his annual income, and the same is equally true of nations. How stands the matter with us in this respect?

In 1837 we imported in flour and wheat,	$4,276,776	
In the same time we exported of the same,	3,075,475	
Leaving a blance against us of	$1,201,201	for our bread.
In 1837 we imported of sugar,	$7,205,904	
And we exported,	76,181	
Leaving against us a balance, of	$7,129,723	for our sugar.
In 1837 the whole of our imports was	$140,989,217	
And the sum total of our exports was	117,419,276	
Leaving against us a balance of	$23,569,941	

But it will be said, this balance is paid, and the debt cancelled. So it is, but how? by transferring the account from the individuals who contracted it, to the country itself. In other words, this twenty-three millions and many more similar balances of trade against us, have been paid in stocks, or the credit of the states has been loaned to secure the foreign dealer. These balances of trade against us *are not paid*, and when they will be, if we continue to buy much and sell little, is beginning to be a serious question. We are in a fair way to have a national debt accumulated upon us equal to that of Great Britain; a debt, to pay the interest of which, is now weighing her agriculturists and manufacturers to the dust. The only difference will be, her indebtedness is to her own citizens; ours will be to foreigners, and a fearful power it will be for them to wield over us.

How shall this alarming evil be remedied? It would be easy to say, retrench, buy less, and sell more. But such is not usually the course of individuals or nations. We have gratified our wants until they have become so interwoven with our system, that retrenchment in the means of satisfying them is not likely to be a favorite doctrine, however just and feasible it may be. The only way, then, for us, if we will have just so such, is *either to produce the things ourselves, or something that will pay for them.* We *can* raise our own *bread*, and have a large surplus to sell. We can make all the *sugar* demanded in the country, and we must do it. We can make the silk wanted in the United States, and if we are wise we shall soon do it, and put a stop to the largest item in the balance against us; an item of from fifteen to twenty millions annually. Supply ourselves with these three items, and we turn the balance of trade in our favor, and bring the world in debt to us. In that case we should become a "debt-receiving" instead of a "debt-paying nation," and the differ-

ence there is between the actual pleasure of these two operations, (to say nothing of the profit,) will be appreciated by most.

SILK MANUFACTURING.

From the Genesee Farmer.

One great reason why we have such an unshaken confidence in the ability of this country to enter successfully into the culture of silk, its manufacture as well as its production, is found in the superior enterprise, industry and ingenuity of our citizens, over those of any part of the world. Great Britain thought to prevent the establishment of the cotton manufacture in this and other countries, by prohibiting, under severe penalties, the exportation of machinery, or patterns for its construction. New England machinists went to work, built shops, made their own patterns, and produced specimens of machinery so much superior in action and principle to European models, that we at once obtained the preference in their own market, and now annually export large quantities of machinery to order. So it is already with machinery for the manufacture of silk. In reeling, and now in weaving the narrow kinds of silk, such as laces, ribbons, and other goods of that description, we have already made great advances on the clumsy and ill-arranged implements of the old world.

In the manufacture of ribbons, which forms so important a branch of the Lyons, or French silk manufacture, the foreign workman uses a narrow loom, resembling the common hand-loom in either respects, and weaving but one piece of ribbon at a time. A machine, called in France a Jacquard, is attached to this narrow loom, and regulates the pattern of the ribbon, flowers, &c. These looms are worked by girls, and these delicate and beautiful fabrics are the result of their labors. A Jacquard was brought to New-York, and fell under the notice of Mr. Bergen, an ingenious mechanic, and member of the legislature. Mr. Bergen instantly saw that great improvements might be made in the machine and loom, and immediately constructed one which is worked by power instead of the hand, makes seven pieces of ribbon or lace, where only one was made in the French loom, and gives the figure, color, or pattern, with equal exactness and greater rapidity. In this single improvement of the ribbon loom, then, five or six-sevenths of the labor required abroad is wholly dispensed with, and articles of any pattern can at once be furnished. In very narrow patterns, from ten to fifteen pieces can be woven at once. Such improvements at the outset leave no room for doubt, but that when the attention of our artizans shall be directed to the manufacture of silk machinery, we shall soon find our improved processes amply to compensate for any supposed difference in the price of labor.

DEPTH OF FROZEN EARTH IN NORTHERN LATITUDES.

From the Genesee Farmer.

Mr. Schergin, a merchant of Jakutsk in Siberia, anxious to possess a well from which water might be obtained without being obliged to use melted ice for half the year, commenced boring through the frozen earth which always exists at a short distance below the surface, with the intention of reaching the unfrozen springs below. The place is in lat. 62° the themometer in December as low as 42° below zero, and in July was 79° above. Average temperature 18°. After penetrating 50 feet, the temperature was found to be 18°. At 77 feet 19°. At 119 feet 23°. At 382 feet 30°. This rate gives an increase of temperature of 1° for every 60 feet; and proves that the boring to unfrozen water must equal about 600 feet. As a necessary consequence, the large rivers and springs in such districts must draw their supplies from regions farther south, and below the frozen strata, or they would be dry every winter, which in Siberia is found to be the fact with most of them. Wrangel and Frebre state that in Siberia, in the open lands, the surface is thawed during the summer to the depth of 2 1-2 to five feet; but that in the forests it only reached from 3-4 foot to 1 1-2 in depth. This is a curious fact, as showing how near vegetation can be brought in contact with ice, and that growth in plants depends more on the temperature of the air in the spring, than on that of the soil.

ON KEEPING POULTRY.

From the Maine Farmer.

Messrs. Editors :—I once knew a couple of industrious sisters, who lived near a never failing brook or stream in Massachusetts, who kept generally through the winter 30 geese, male and female. They had erected some suitable but not costly sheds, in which they had apartments for them to lay, set and hatch. Their food in the winter was meal of the various kinds, to some extent, but principally apples and roots. In the summer they had a pasture inclosed with stone wall or board fence, which embraced the water.—They kept their wings so clipped that they could not fly over such fence. Their owners well knew (what we all know,) that live geese feathers are a cash article, at a fair price. They picked off their feathers three times in the season. Those 30 geese wintered, would arise say 75 goslings or young geese, and of course they had that number to dispose of every fall or in the beginning of winter, when they are sent to market, and again picked making four times that they obtained feathers from those they wintered, and twice from the young ones that they killed.

I tell the story to induce some family, sisters or brothers, fathers or mothers, situate near some never failing brook of water, to go and do likewise. Those remote from water cannot be benefited by the history, yet their friends may; but if I can by this account cause one family to partake of the benefits of the business, I shall be satisfied. Many families there are, in all our towns, so situated that they may make the raising of geese a profitable business; yet perhaps have never thought of their privileges. It is known that we import most of our feathers; and is it necessary to send abroad for an article so easily produced among us? Those who calculate to commence the business must prepare for it the ensuing fall, and not kill their geese. No one will object to the keeping of even more than 30 geese, if an enclosure is made sufficient to keep them at home and out of mischief.

N. P.

COWS HOLDING UP THEIR MILK.

From the Maine Farmer.

Messrs. Editors:—You will recollect that in a late No. of the Farmer I mentioned that I had a cow that gave very little milk in the morning, and that she gave more at night as a consequence, &c.; and that a Mr. Foss had a cow that did the same. I requested the why and wherefore of you or some of your correspondents, and also the cure. You remark that you had a cow with the same complaint, and thought possible some one milked her besides yourself. I hear that many other people are making similar complaints of their cows.

As I think I have discovered the cause, I will state it as respects mine. She lodges on sand or gravel in a yard where there is no sward or orts, hay or straw, and during this long spell of wet weather her lodging had been cold. At the suggestion of a neighbor, after the cow was milked at night, I sent her back to the pasture where she might lay on a ledgy warm place, and the cure has been effected; whether by this or not you and others may judge. I know that in the fall, when the weather is colder, and the nights longer, the same result does not take place when our cows lay out. But then their hair is longer,—mine having recently shed her old hair and the new being very short. I wish that others having cows that hold up their milk will try my remedy, and let me know the result. SAM'L. WOOD.

LIQUID LEATHER.

From the Maine Farmer.

We have seen it stated that some one in Europe has invented what he calls liquid leather. The process he keeps a profound secret, but it is said the matter is liquid, and may be cast into any form such as boots, shoes, &c.

The material is probably some preparation of animal gelantine, at any rate we will *guess* so. If animal gelatine be mingled with the proper quantity of tannin, such as the strong liquor of hemlock or oak bark, it coagulates and becomes solid. Now if the two ingredients can be properly proportioned, no doubt it can be formed into any shape whatever.

It is this which changes skins or hides into leather. Hides however have fibers which add to the toughness and strength of the leather, which might not be the case in changing gelatine to leather. Some one who has leisure to experiment upon it, can take glue and bark liquor and amuse himself, and perhaps find out something new to him, if he don't get the real secret. If you spit into strong bark liquor, a coagulum is formed occasioned by the slight quantity of mucus matter contained in the spittle. If raw hide be put into a Papin's digester, which is a small steam boiler with a safety valve so that the water can be heated much higher than boiling water,(212°) and heated for some little time, it will become almost wholly or quite dissolved, and in this form it might be better for experimenting upon perhaps than a simple solution of glue, which is purer and has less animal fibre.

Horns may thus be rendered almost or quite fluid in this way, and undoubtedly might be put to many more uses than they are at present.

TO FATTEN POULTRY.

From the Maine Farmer.

An experiment has lately been tried of feeding geese with turnips cut in small pieces like dice, but less in size, and put into a trough of water; with this food alone, the effect was that 6 geese, each when lean weighing only 9 lbs., actually gained 20 lbs. each in about three weeks fattening.

Malt is an excellent food for geese and turkeys; grains are preferred for the sake of economy, unless for immediate and rapid fattening: the grains should be boiled afresh.

Other cheap articles for fattening are oatmeal and treacle; barley-meal and milk; boiled oats and ground malt.

Corn before being given to fowls should always be crushed and soaked in water. The food will thus go further, and it will help digestion. Hens fed thus have been known to lay during the whole of the winter months.

EARLY CUT CLOVER.

From the Boston Cultivator.

In 1818, when living on the banks of the Kennebec, in Maine, we had a fine piece of clover that we feared would grow too rank to be relished by our cattle. We therefore mowed it on the twenty-fifth of June when not one-half the heads had blown fully out.

We suffered it to lie *in the sun* for three days —turning it over at night to bring the greenest side up to take the dews. On the third day it was raked and carted. We cannot say we saved all the heads and the leaves, but we looked to the main chance; we saved the stalks—the substance —and our cattle would insist on eating them all.

In feeding out this hay we could not but note the difference between a forkful of it and a forkful of hay cut late. It was apparently one-third heavier. Our cattle never throve better on any hay, and their manure, not black as when their keeping is poor, or late cut hay, looked precisely as if they had been kept partially on Indian meal.

TEMPERATURE IN GREAT BRITAIN AND THE UNITED STATES

From the Genesee Farmer.

While the average temperature of the year in England exceeds that of the northern part of the United States, the average of the three summer months there, falls very much blow the average of the same months here. Thus in the agricultural reports of some of the English counties for last year, it was stated that "frosts were frequent during the months of July and August." We have been sometimes asked why corn as well as wheat cannot be grown in England. The true reason is found in this low temperature of the summer months; which while it proves not unfavorable for wheat, renders the ripening of corn impossible. Wheat will be best in a temperature that averages from 60 to 70 degrees, as the stalk takes more time to grow, does not suffer from drought, and gives a finer, heavier berry than is usually produced where

the temperature is higher. Great Britain is of course one of the best wheat countries in the world. Corn on the contrary will not arrive at maturity under a less degree of heat than from 70° to 80°, and if the average of the three summer months does not range between 75 and 80, a good crop of corn can hardly be expected. Thus in England corn will never be grown; a law of nature that cannot be broken forbids it.

CAUSE OF GREATER VALUE OF GYPSUM ON LIMED LAND.

To the Editor of the Farmers' Register.

One of your correspondents, whose communication you published in the July number of the Register, uses the following language. "I can assure you and your readers, that that the use of plaster of Paris, after lime, works strangely and wonderfully. You may explain why it is so; for me, it is sufficient to see and know that it so." I readily agree with your correspondent that in such a case fact is of more importance than theory; but I suppose most of the readers of the Register will admit that fact and theory together, is better than either of them separately. Indeed mankind are naturally theorizers; that is, when any thing unusual occurs in the natural world, they are disposed to inquire into the causes, and however valuable the knowledge the fact above may have been, yet when, in addition to the fact, a knowledge of its cause is obtained, it affords an exquisite pleasure to the mind. Indeed I have long been of opinion that one important use of mechanical and chemical philosophy, is, that they render much of the common business of life more intellectual, and, on that account, will be more relished by men of cultivated minds. I am far, however, from supposing that this is the only or even the principal use of mechanical and chemical science. But I did not sit down to write a treatise on the use of science; but to endeavor to furnish your correspondent with a theory to explain his fact; for, notwithstanding his apparent indifference about theory, I am disposed to believe that it will afford him considerable pleasure to be able not only to say that the fact is so; but also to say why it is so.

I have long had a theory upon the subject which your correspondent mentions, which, to myself at least, was entirely satisfactory; so that had I been a neighbor to your correspondent, and witnessed the fact which, it seems, was to him strange and wonderful, would have been to me neither the one nor the other, but precisely the thing, I would have expected. I will now proceed to explain my theory, and the process by which it was obtained.

There is scarcely any fact more obvious than this, that the great volume or bulk of all vegetables is carbon. Although this fact was doubtless known from time immemorial, yet it seems to have attracted no attention in a theoretic point of view until modern times. When the attention of modern chemists was turned to the vegetable department of science, they naturally inquired, whence and how do vegetables obtain the carbon which constitutes so large a portion of their substance? This was a question not easily answered. Carbon is a simple substance, and insoluble in water. It is moreover not found to exist in the most productive soils, nor even in the richest manures. Some chemists, not adverting to the fact that carbon is insoluble in water, supposed that pulverized charcoal would be an excellent manure. A Dr. Ewell, a native of this state, published, about the beginning of the present century, a book in which he asserted, with great apparent confidence, that pulverized charcoal would be one of the best of manures. A friend of mine who was largely engaged in rectifying that abominable thing called whiskey, and consequently used a large quantity of pulverized charcoal, made the experiment. But he found that charcoal, though ground as fine as flour was not a manure. He might as well (as Professor Armstrong expresses it,) have used pounded glass.* But my friend, the rectifyer of whiskey, was not the only person who made the experiment. Experiments were made in various parts of the world, and all with like success, or rather want of success. Still, the question whence do vegetables obtain their carbon, remained unanswered. At length by a variety of experiments carefully made, by different experimenters, in different parts of the world the question was satisfactorily answered. *It is from carbonic acid, that vegetables obtain their carbon.* The roots of the vegetables attract from the soil the water or moisture mixed with carbonic acid, and as the water thus mingled with carbonic acid passes up through the tubes of the vegetable, by a process concealed from mortal ken, the carbonic acid is decomposed, and when the sun shines on the vegetable, the oxygen of the acid is breathed forth into the atmosphere and the carbon is retained. This beautiful theory is surely as interesting as a view of the passage of the Potomac through the Blue Ridge, which Mr. Jefferson said, was worth a voyage across the Atlantic. Nearly one-half, by weight, of limestone, marble, in short of all carbonates of lime, is carbonic acid. Quick-lime, or lime when newly burnt, has no carbonic acid, but its attraction for carbonic acid is so great, that, if exposed to the atmosphere, it soon saturates itself with carbonic acid, and thus returns to the state of a carbonate. When a man then limes his land, he mixes with it an article which possesses not only the various valuable qualities which you, Mr. Editor, have so well pointed out in your invaluable 'Essay on Calcareous Manures;' but, also possesses the power of attracting from the atmosphere and retaining in the soil ready for use, the very thing which furnishes their chief food to all vegetables.

But the carbonate of lime is a concrete substance, and its carbonic acid is intimately combined with the lime; hence, it will not, we may suppose, easily yield its acid to the rains and moisture of the earth, and what it does yield, will be parted from slowly, and in small quantities. But as the carbonate of lime possesses various other properties besides the one I have just mentioned, when it it first applied to the land, it may produce a powerful effect chiefly by those other properties, but ultimately becomes chiefly useful as a depository of carbonic acid. But this acid it parts with

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* See Professor Armstrong's Essay on Vegetable Physiology, July No. of the Farmers' Register, Chapter XVI.

reluctantly. Then apply a little plaster of Paris, (sulphate of lime) and by their mutual action on each other the carbonate of lime easily yields its carbonic acids, and the vegetables growing on the soil thus having an ample supply of carbon, will grow as they had never been seen to grow on that soil before.

Now, your correspondent, to whom this is chiefly addressed, will see what my theory is, and most of the steps by which my mind was led to embrace it. He will see, moreover, that it accounts for the great effect the plaster of Paris produced upon his limed land. Before I conclude, I ought to remark that although I have called the above theory "my theory," I do not mean to assert that it is exclusively mine. Doubtless the two ideas, viz. that one of the chief uses of lime or marl, as a manure, is, that it furnishes a supply of carbonic acid, and that the use of gypsum will facilitate the extrication of that acid, have occurred to the minds of many other persons; each one may say, the theory is mine, but not exclusively mine. It is one however which I have entertained for many years.

I entirely agree with your correspondent, when he says that "lime only will show where the great father of nature has placed the limit of fertility, when lime, plaster, and their produce of vegetable matter, are turned back and reacted upon." Clover I presume takes badly in the light sandy lands of tide-water Virginia. Whenever persons, who have brought their lands to moderate state of fertility, by lime or marl, find this to be the case, let such persons supply themselves with rollers to be drawn either by one or two horses. Immediately after sowing the clover seed, run a roller over the field, and, if the season is not unfavorable, the seed will vegetate and grow. When the clover is of suitable age, sow gypsum for two years, and during the fall of the second year, be the clover knee high, or haunch high, plough it down. Next spring plant the field with corn, and go on with a judicious rotation of crops, careful husbanding and application of putrescent manures, and the next generation may see some of the pine barrens of tide-water Virginia producing from twelve to fifteen barrels of Indian corn to the acre.

I have already referred to Professor Armstrong's Essays on Vegetable Physiology, which you have been for some time publishing in the Farmers' Register. I would recommend them to the especial attention of your readers generally, both male and female. They are written in a plain, familiar, perspicuous style, and contain much interesting and valuable information. I fear many of the readers of the Register overlook those essays, under an impression that they are too learned for common readers. But, if any intelligent person, although without any previous knowledge of chemistry, will begin at the beginning of those essays and read them regularly on, I am much mistaken, if he will not find that he can understand them with ease, and will find a new and delightful field of knowledge opened to his mind. Even those who have already some knowledge of chemistry, will find them pleasant and useful. SENEX.

CIRCULAR LETTER OF THE COMMISSIONER OF THE PATENT OFFCE.

[The following letter will best explain its excellent object. It is earnestly hoped that the zeal of the Commissioner for the advancement of agricultural interests may be properly responded to by the various individuals to whom the circular has been addressed, and his object furthered, and made sure, by the proper aid of government.—ED. F. R.]

Washington City, D. C., Patent Office, June 1st, 1839.

SIR,—During the last session of congress, an act was passed authorizing the Commissioner of Patents to collect statistics, and in various other modes, to promote the agricultural interest of the United States. For this purpose a small appropriation was made.

Deeply impressed with the importance of this subject, and regarding it as the commencement of a system, which, if properly carried out, will confer incalculable benefits on our common country, I embrace an early opportunity, very respectfully to invite your co-operation in introducing foreign seeds which are rare and valuable.

In calling your attention to this subject, I cherish the belief, that all citizens of the United States, who reside or travel abroad, especially the diplomatic corps, officers and gentlemen of the navy, and commanders of private vessels, will cheerfully, so far as primary duties allow, aid in the measures which the national legislature purposes to accomplish.

Some general directions for packing the seeds, accompany this circular. Please transmit to this office such collections as you may make by public vessels, (as far as practicable) whose commanders are fully authorized to receive the same. Reasonable freight, however, will be paid by this office for shipment in private vessels.

An exhibition of the spike of the different grains, indigenous and exotic, is contemplated in the new Patent Office; hence the importance of sending, if possible, a specimen of the original stalk with the grain attached.

I have the honor to be,
With high respect,
Yours, obediently,
HENRY L. ELLSWORTH.

Directions for putting up and Transmitting Seeds.

With a view to the transmission of seeds from distant countries, the first object of care is to obtain seeds that are fully ripe, and in a sound and healthy state. To this the strictest attention should be paid; otherwise, all the care and trouble that may be bestowed on them will have been wasted on objects utterly useless.

Those seeds that are not dry when gathered, should be rendered so by exposure to the air, in the shade.

When dry, the seeds should be put into paper bags. Common brown paper has been found to answer well for making such bags. But as the mode of manufacturing that paper varies in different countries, the precaution should be used of putting a portion of the seeds in other kinds of paper. Those that most effectually exclude air and moisture are believed to be the best for that purpose. It would be proper, also, to enclose some of the seeds in paper or cloth that has been

steeped in melted beeswax. It has been recommended that seeds collected in a moist country, or season, be packed in charcoal.

After being put up according to any of these modes, the seeds should be enclosed in a box, which should be covered with pitch, to prevent injury from damp, insects, and mice. During the voyage, they should be kept in a cool, airy, and dry situation; not in the hold of a ship.

The oily seeds soonest lose their germinating faculty. They should be put into a box with sandy earth, in the following manner: first, about two inches of earth at the bottom; into this the seeds should be placed at distances proportionate to their size; on these another layer of earth about an inch thick; and then another layer of seeds: and so on, with alternate layers of earth and seeds until the box is filled within about a foot of the top, which space should be filled with sand; taking care that the earth and sand be well put in, that the seeds may not get out of place. The box should then be covered with a close net-work of cord, well pitched, or with split hoops or laths well pitched, so as to admit the air without exposing the contents of the box to be disturbed by mice or accident. The seeds thus put up will germinate during their passage, and will be in a state to be planted immediately on their arrival.

Although some seeds with a hard shell, such as nuts, peaches, plums, &c., do not come up until a long time after they are sown, it would be proper, when the kernel is oily, to follow the method just pointed out, that they may not turn rancid on the passage. This precaution is also useful for the family of laurels, (laurineæ) and that of myrtles, (myrti,) especially when they have to cross equatorial seas.

To guard against the casualties to which seeds in a germinating state may be exposed during a long voyage, and as another means of ensuring the success of seeds of the kinds here recommended to be put into boxes with earth, it would be well, also, to enclose some of them (each seed separately) in a coat of beeswax, and afterwards pack them in a box covered with pitch.

It may not be necessary, in every case, to observe all the precautions here recommended in regard to the putting up and transmission of seeds; but it is believed that there will be risk in departing from them, in proportion to the distance of the conntry from which the seeds are to be brought, and to the difference of its latitude, or of the latitudes through which they will pass on the voyage. It is not intended, however, by these instructions, to exclude the adoption of *any other modes of putting up and transmitting seeds and plants, which are in use in any particular place, and which have been found successful*, especially if more simple. And it is recommended, that not only the aid of competent persons be accepted in procuring and putting up seeds and plants, but that they be invited to offer any suggestions in regard to the treatment of the plants during the voyage, and their cultivation and use afterwards.

EXPERIMENTS ON THE POROSITY OF A MASS OF COTTON.

From the Journal of the Franklin Institute.

Perhaps you may consider the following pretty experiment on porosity, worthy of a place in your Journal. Fill a common glass tumbler, or other vessel, completely with some spiritous liquor, so that a few drops more would cause it to overflow. This done, you will find no difficulty in introducing into the tumbler, so filled, *a whole handful of raw cotton.*

This experiment was suggested by the accidental recovery of some wet cotton from a boat which had been sometime sunk in the Tennessee river; it was found by the workmen that after they had squeezed out the water from some cotton, the vessel in which it had been contained, remained nearly as full as before the cotton was removed.

Spirits answers better than water, for trying the experiment, from the rapidity with which they are absorbed by the cotton. Several theories were started by persons who tried the experiment; such as, that the filaments of cotton occupied the vacancies between the globules of water; or that by its capillary action, the cotton subdivided the globules, and caused them to occupy a less space, &c.; to me, however, it appears to be accounted for more satisfactorily, by supposing the fluid to insinuate itself between the filaments of cotton, and thus permit the latter to occupy no more space than is due to their actual solidity. The experiment is certainly a beatiful one.

Very respectfully, yours, &c.,

JOHN C. TRAUTWINE.

Knoxville, Tennesse, June 12, 1839.

ON THE INFLUENCE OF NATIVE MAGNESIA ON THE GERMINATION, VEGETATION, AND FRUCTIFICATION OF VEGETABLES.

By Angelo Abbene.

Among the various causes which produce barrenness in lands, has been enumerated the presence of magnesia, because it had been observed that the various magnesian soils are steril. This opinion has begun to lose credit, since Bergmann, who examined the composition of fertile soils, considered magnesia as forming one of their principal constituents.

Prof. Giobert has performed a number of experiments to inquire into the action of native magnesia, which is found in numerous cultivated soils. In the environs of Castellamonte and of Baldissero, this substance is abundantly diffused in the soils cultivated with great success, and which exhibit a vigorous vegetation. There are many districts in Piedmont and elsewhere, where the bicarbonate of lime and of magnesia is abundant in the cultivated lands, which produce beautiful plants. Giobert concluded from these experiments —1st, that native carbonate of magnesia is not injurious to the various functions of vegetables; 2nd, that on account of the solubility of magnesia in an excess of carbonic acid, this earth can exercise an action analogous to that of lime; 3rd. that a magnesian soil may become fertile when the necessary manure is employed.

From these facts naturally proceeds the conclusion, that if the magnesia was dissolved in an excess of carbonic acid and water, and had entered like the lime into the composition of the sap, it ought to be found in the plants with the potash, lime, oxide of iron, &c. M. Abbene has ascertained

his by the analysis of the ashes of plants which had grown in magnesiferous mixture. Moreover he endeavored to find by comparative experiments, whether the influence of magnesia on vegetation is analogous to that of lime. The following are the conclusions he arrives at: 1st. Native magnesia is not only not injurious to the germination, vegetation, and fructification of plants, but, on the contrary, appears to be favorable to these functions. 2nd. Magnesia being soluble in an excess of carbonic acid, has on vegetation an action analogous to that of lime; and when a soil contains magnesia not sufficiently carbonated, this defect may be remedied by the addition of manure, which by its decomposition furnishes the necessary quantity of carbonic acid; the amelioration will be much more efficacious if the soil be frequently disturbed, as then the air will better exercise its action. 3rd. When lime and magnesia exist in arable lands, the former is absorbed in preference by the plants on account of its greater affinity for carbonic acid. 4th. In barren magnesian lands, it is not to the magnesia that the sterility must be attributed, but to the cohesive state of their parts, to the want of manure, of clay, or of other composts, to the large quantity of oxide of iron, &c. 5th. Barren magnesian soils may be rendered fertile by means of calcariferous substances, as rubbish, chalk, ashes, marl, &c., provided the other conditions be fulfilled. —*Jour. de Pharmacie* de Janvier, 1839.

OBSERVATIONS ON THE CULTURE OF THE STRAWBERRY.

By A. J. Downing, *Botanic Garden and Nurseries, Newburgh, N. Y.*

From the Genesee Farmer.

The strawberry is certainly one of the most valuable and delicious of all the smaller fruits. It is not only easily cultivated, yielding an abundant crop in a short time, from a very limited space of ground; but while its pleasant sub-acid flavor is agreeable to all palates, and forms one of the most delightful additions to the dessert in summer, it is also extremely wholesome, never, as is the case with most other fruits, undergoing the acetous fermentation. In some diseases it has even been found highly beneficial, and it is affirmed that Linnæus was cured of the gout by abundant use of the berries.

The strawberry, through a low herbaceous plant, sends down remarkably strong roots. In good soils these are often found to penetrate to the depth of eighteen inches or more in a season. It is necessary, therefore, to produce a fine bed, that the soil be deep as well as rich. Where the subsoil is not positively bad, the ground is always much improved by trenching, (two spades deep,) before setting the plants. In doing this, a good coat of manure should be deposited between the two spits: old garden soils which have been long cultivated, are astonishingly improved by this practice, the whole becoming renewed by the presence of the fresh soil; and the growth of plants in such mould, when again acted upon by the sun and air, is of course proportionately vigorous. A deep mellow loam, rather damp than dry, is undoubtedly the preferable soil for this plant; but almost any soil for so limited a species of culture, may, in the hands of a judicious gardener, be rendered suitable for it. We have seen very splendid crops of fruit upon a very stiff yellow clay, mellowed down by mixing with it anthracite coal ashes and manure.

The best season for making new plantations of the strawberry is either in spring, at a pretty early period, or directly after the beds have ceased bearing, in August. If the latter time is chosen, the plants generally get sufficiently well established to bear a considerable crop the ensuing year.

There are various modes in which to plant the beds when formed. Some arrange the plants so as to be kept in hills, others in rows, and others, again, allow them to cover the whole surface of the bed. We consider the first method preferable, as in that way the ground can be kept cultivated between the plants; the fruit is generally larger and finer, being more exposed to the genial influence of the sun, and the duration of the bed is greater. Three or four rows may be planted in each bed, at a suitable distance apart, and the runners from the rows should be shortened or cut off about three times during the season. If the plants are not thriving well, a light top dressing between the rows in autumn will be of great advantage. Burning off the upper surface of the bed in the spring has been highly recommended by some persons, but we have never found it to answer our expectations upon trial.

This fruit receives its name from the very ancient custom of placing straw on the beds, between the rows of plants, to preserve the berries clean. The custom is not yet too antiquated to be of less value to those who desire the fruit in its greatest perfection. Clean wheat or rye chaff may be substituted for straw, and it has the very great additional advantage of not only preventing most weeds from growing, by excluding the light, but also, by decomposing with considerable rapidity after the fruit season is past, it contributes much to the enrichment of the surface soil of the bed. Young and strong runners well rooted, should in all cases be chosen to form the new bed, and not old plants, or those offsets which grow near them.

There is a fact with regard to the strawberry plant little known, the ignorance of which puzzles many a good cultivator. This is the existence of separate fertile and steril or barren plants in many of the varieties, otherwise plants which produce chiefly male, and others that produce only female flowers. Botanically, the strawberry should produce both stamens and pistils in each flower, and the blossoms should consequently all mature fruit. This is really the case with the alpine, the wood strawberries, &c., but not entirely so with the large scarlet and pine strawberries. These latter sorts, it is well known, produce the largest and finest fruit; but we very often see whole beds of them in fine flourishing condition, almost entirely unproductive. The common parlance in such cases is that the variety has run out, or degenerated; but the idea is a confused and ignorant one, while the healthy aspect of the plants fully proves the vigor of the sort.

The truth is, that in all strawberries of the foregoing classes, although each blossom is furnished with stamens and pistils, yet, in some plants the pistils are so few that they can scarcely be perceived; in others, there are scarcely any stamens visible. When the plants bear blossoms furnished

with stamens only, (or in a large proportion,) they are of course barren; when pistils only are produced in abundance, they are fertile. To have a bed planted so as to bear abundantly, about one plant in eight or ten should be staminate or barren blossoming plants; the others the fertile ones—for if the lattar only be kept, they alone will also be found unproductive.

If any person will examine a bed of the Hudson or any of the large scarlet strawberries, when they are in blossom, he will discover a great number of plants which bear large showy blossoms filled with fine yellow stamens. These are the barren plants. Here and there, also, he will discover plants bearing much smaller blossoms, filled with the heads of pistils, like a small green strawberry. The latter are the fertile ones. Now the vigor of the barren plants is so much greater than that of the fertile ones, and their offsets are so much more numerous, that if care be not taken to prevent this, they soon completely overrun and crowd out the fertile or bearing plants, and to this cause only is to be attributed the unproductive state of many beds of the large fruited strawberries, which are in many instances perhaps, entirely devoid of fertile plants.

The proper method undoubtedly is to select a few fertile plants of each kind, plant them in a small bed by themselves, and allow them to increase freely by runners; then, on planting, the proper proportion could be made and kept up by the regular clipping of the runners.

Many of the fine English varieties of strawberry, (Wilmot's superb, for instance,) are generally found worthless here. This is owing, in some cases, to the ignorance or want of care of those persons who export the varieties, in sending often, no fertile plants; in other instances, it is equally owing to our negligence here, in not preserving the due proportion of barren and fertile plants.

This peculiarity in the blossoms is very little known or understood, even among scientific cultivators. It was first pointed out to us by our esteemed friend, N. Longworth, Esq., of Cincinnati, one of our most distinguished western horticulturists. Its truth we have repeatedly verified, and a slight examination will convince any person of the cause of the numerous worthless yet thrifily looking strawberry beds throughout our gardens.

The finest of the large English varieties of this fruit which we cultivate here is the Bishop's. It is remarkably large, a most abundant bearer, and of superior flavor. Many of the larger berried sorts, as the Methven Castle, have been hollow and comparatively tasteless, though of uncommon size. This variety, however, appear to us to unite all that can be desired, to constitute a truly fine and delicious strawberry. A. J. D.

INSECT DEPREDATORS.

From the Genesee Farmer.

Of the insect tribes there are many that occasionally prey on the vegetables produced by human labor, some making their appearance at one season, or in some particular year, while others are irregular in their visits, and at times disappear for years in succession. Occasionally, too, new depredators make their appearance, or as is most probable, first attract notice by the mischief they produce. Some insects feed only while in the larva state, and hence the mischef they occasion is performed while in that stage of their existence. Others spend their larva state inactive; but while existing as perfect insects, are most destructive; while a few are injurious in both of these states. Thus it is, the larvæ of the Hessian fly, the cut grub and army worms, that occasion such loss to the farmer; while the chinch and rose bugs, the grasshopper and locust, are injurious only while they live as perfect insects. A knowledge of the history, habits, periods of existence, and depredations of the most formidable insect depredators is very necessary to all classes of cultivators, and we may be permitted to hope that this desideratum will be supplied by the gentlemen who are now, by authority, engaged in investigating the entomology of some of the principal states.

Few years pass, in which, on the whole, more injury is not sustained from these pests of agriculture, than has occurred in the present. Some districts have, it is true, suffered severely, but the insect visitation has not been general, or unusually destructive where it has occurred. The three principal depredators of the present year have been the Hessian fly, the chinch bug, and the army worm. The first of these has scarcely been noticed, and has produced no injury worth mentioning, except on the tide water districts of the middle and southern states. Here it was very prevalent, and for a time created much alarm. At harvest, however, the damage, though considerable, was found to have been overrated; the very fine weather bringing the crop forward in spite of the fly. It has hardly been mentioned north of the Delaware. The chinch bug is peculiary a southern pest, very destructive to crops, and its origin, habits and transformations, judging from the little we have been able to find respecting it, does not appear to be at all understood, even in those districts where it is most prevalent. These districts are what may be called the first table lands of the south, or those lying between tide level and the first ranges of highlands. It is described as making its appearance in immense numbers in the woods, from which it spreads in every direction, attacking indiscriminately wheat, corn, and indeed the most of the cultivated grains and grasses. No method as yet has been found effectual to arrest their progress. Though provided with wings, they rarely use them, but march forward on the earth, feeding on whatever attracts them during their progress. Their disappearance is as sudden as their appearance, and apparently equally involved in mystery. An investigation of the habits of this insect is well worthy the study of the southern man of science, as its frequent appearance, and the loss it occasions, render it a formidable enemy to the farmers of the districts in which it most prevails. The army worm is the name given to the larva or caterpillar produced by some one of the countless family of the moths, though what one, does not yet appear to have been ascertained. It has received its name from the numbers in which it appears, the seeming order and regularity of its movements, and its destructive voracity. Wherever it appears, and whichever way the dense masses are directed, vegetation disappears with astonishing celerity. Before, is the garden of Eden; behind is a desolate wilderness. The present season it has done much injury in Illinois, parts of Indiana and Michigan; and a few

have appeared west of the Mississippi. A few years since it committed fearful ravages in Ohio. No accurate description of this depredator appears to have been published; and for the purpose of aiding in calling attention to the insect in question, we should be much gratified if some of our subscribers in those districts where it is, or has been most abundant, would furnish us an account of the worm, its appearance, ravages, the miller or moth that produces it, if known, or any other particulars that may be interesting in elucidating its character and history. The only method of checking the march of this insect yet discovered, is to plough a deep furrow across the line of progress, or around the field to be preserved from them, keeping the sides smooth with the hoe, and the worm falling into this furrow, is unable to escape, and perishes. The numbers so destroyed in a single trench, is almost incredible.

AGRICULTURAL GEOLOGY.

From Prof. Jackson's Third Report on the Geology of Maine.

As I have formerly stated, it is evident from an examination of the mineral ingredients of soils, that they *all originated from the decomposition and disintegration of rocks which for ages have been acted upon by air and water;* those agents having, by their mechanical and chemical powers, shivered and crumbled the solid ledges into those pulverulent matters which form the basis of all soils—to which, subsequently small quantities of vegetable humus are added by the decay of plants.

Ancient soils. There have been various epochs in the earth's history, when soils were thus formed, and after bearing their luxuriant vegetation, were reconverted by aqueous and igneous causes, into rocks, the structure, and fossil contents of which, denote ther origin to have been from sedimentary matter,hardened by pressure and heat. Thus, when we look back to the epoch of the transition formations, we find the rocks composing that series to be composed of agglomerated sand and pebbles, cemented by clay, which presents itself in an indurated form, the result of igneous action. Marine shells, contained in the grauwacke rocks just described, evince that this deposit was chiefly formed beneath the waters of the sea, while some portions of it were deposited in fresh water, as proved by the presence of certain plants, peculiar to bogs and lakes. The slates of this formation contain prints and casts of numerous plants—such as ferns, equisetaceæ, lepidodendræ and stigmaricæ; while beds of anthracite coal showing by their structure and composition their vegetable origin,are also included between the strata.

Now it is evident, that the above mentioned plants could not have grown without a soil, and the rocks in whch they are imbedded bear every proof that they were once in that condition.

Secondary soils. We come next to the secondary epoch, and here again we are astonished to find proofs of a numerous succession of alternating beds of soil, each having, for long periods of time borne their perennial verdure of intertropical plants, allied to those above noticed, but more complicated and perfect in their structure. The sandstones and shales of this formation are vast herbaria of ancient vegetation, and their strata contain, well preserved between their sheets, perfect impressions of numerous genera of plants, the species of which are now extinct. Large trunks of trees are also exposed by opening coal mines and quarries of sandstone, while the numerous and reiterated strata of coal itself also bear ample proofs of their vegetable origin.

Here, then, we have another epoch, at which soils existed, produced their abundant vegetation, stored the earth with fuel, and then were reconverted into solid rocks, to be again subjected to the wear and tear of elemental strife.

The *tertiary epoch* was of a milder character and but little disturbance of the solid rocks appears to have been effected during those submersions, when the plastic clay, calcareous marls and strata of perfectly preserved marine shells, were deposited. These sedimentary matters appear to have resulted from a slow and gradual deposition of clay and other fine sedimentary matter, which beneath the sea, became soon inhabited by numerous shell fish, and were imbedded in succession as we now find them, since the elevation of the land above the encroachments of the sea.

When we consider the several periods which I have briefly mentioned, it will at once reveal to any reflecting persons, that the world has been during the lapse of inconceivable ages, subject to great revolutions in its geological organization. At one time, the rocks are worn down into soils, and bear their vegetation—then continents were sunk in the ocean's depths, and subsequently were raised again, the soils having in the mean time been converted into rocks. By such consideration, we soon learn to respect the antiquity of the world; and knowing that such records are legibly written on the tablets of stone, we feel a natural desire to read and understand their meaning.

Ancient alluvial soils, or diluvium. Subsequent to the epochs of which I have spoken, we find that another scene of violence disturbed the tranquillity of the great deep, and the northern ocean was hurled, with its seas of ice, over the land, sweeping the loose materials from the very mountain tops, and depositing them far south of their former resting places—while the grooves, scratches and water marks upon the surface of the fixed ledges, show the direction in which the current passed. By such a flood, (proofs of which are nearly universal in Maine, as elsewhere,) the soils were transported and commingled, so that we rarely find a soil similar to the rocks beneath it, but identical with that derived from other rocks which occur to the north and northwest. Having already cited so many localities in proof of this position, I shall not here recapitulate, and the intelligent observer will find so many illustrations in Maine, to satisfy his rational curiosity on the subject, that he need not long remain in doubt as to the facts.

Modern alluvial soils. The present causes which act upon the solid rocks, are both chemical and mecanical. Oxigen,from the atmosphere and from water,is constantly affecting some portions of the work, especially where the rocks contain pyrites. Rivers, torrents, brooks, and even rain, are gradually sweeping away the solid rocks, by their continued action; but more powerful than all others, is the action of freezing water, which, by an almost irresistibly expansive force, rends all rocks into which water can find a passage; and crumbles down those

which are porous in their structure. Upon the coast, the sea ever beating the solid rocks and hurling the loose fragments with the force of battering ordnance against the shores, wears away the ledges, the detritus being either spread out on the bottom, or sifted up at the mouths of harbors and estuaries.

Alluvial soils are produced by the transportation of fine particles, by aqueous agency, from higher sources, and are especially brought down and deposited during freshets, when a river bursts its confines, and being diminished in its velocity, deposits its sedementary matter over the intervales. The force of the wind is also constantly removing fine particles of soil from one district to another, and the dust of ages is of greater importance than is commonly believed. Enough has been said on this subject to excite inquiry, and to stimulate others to look over the pages of nature, for their own satisfaction, and this is all that can be expected from introductory remarks, such as I now offer to the reflecting observer.

It must not be expected that any one locality is to furnish all the data for the elucidation of a general theory; but a discriminating eye will quickly select such as may bear upon the subject in question. Books, relating the observations and experience of others, should also serve to guide those who may engage in this study.

THE TOMATO PLANT A PROTECTION FROM CHINCH-BUG—AND BUCKWHEAT FROM THE TURNIP FLY.

To the Editor of the Farmers' Register.

Indian Creek, Lancaster, Aug. 7th, 1839.

The chinch-bug has made its appearance in this county, but too late I hope to injure very materially the growing crop of corn, which is now, by far the most promising I have ever seen in this region. If this little insect is as destructive as it has been represented to be, to wheat, oats and corn, should I live to the next seeding and planting season, I for one shall seed and plant with serious apprehension of reaping and gathering a short crop. Perhaps I have done wrong to entertain and express such apprehension, I write as if I had forgotten there is an all-wise and omnipotent being who never uses his chastening rod but for the good of his intelligent creatures; and I am convinced when the destructive insect has done that "whereunto it was sent," it will disappear, and not till then, and that there is a "thus far" for it to go, and "no farther." But, sir, while I entertain this opinion, I feel it to be my bounden duty to use every means to repel this destructive invader of our fields. So far as I am informed all efforts heretofore made have had no good effect. A *fact* was a few days part stated to me by a gentleman of this county, which I think ought to be communicated to you as the editor of a valuable agricultural paper, in order that the information may be made general. The gentleman alluded to last spring carried out and manured a piece of ground with ashes and scrapings from around his kitchen and yard, in which were a quantity of tomato seed that vegetated; in working his corn he left standing between the hills of corn plants on about an acre of land; now the *fact intended* to be communicated is, that in all this acre of land not one stalk of corn has been touched by the chinch-bug, while all around about has been fired or rather sucked dry by this insect. About two acres were manured with ashes and scrapings, and the gentleman thinks the tomato plants alone protected the corn among which they grew, there being no difference in the land, or quality or quantity of the manure applied. I mentioned this statement to a gentleman in Northumberland, who seemed to be at once convinced that the tomato plants protected the corn, for said he, "I know that the little bug which is so destructive to cucumber vines will never show itself on them if tomato plants are growing among them." I have thus, sir, made to you the above statement to use as you please. But I do not stand sponsor for the tomato plant.

As the turnip sowing season is near at hand, I will mention (as worthy of notice at least,) that a gentleman residing not far from Baltimore told me that to mix or sow a small portion of buck wheat with turnip seed would certainly prevent the fly (which is often so destructive to early sown turnips) from injuring them. He said that the fly greatly preferred feeding on the buck wheat, and would not touch the turnip as long as there was any wheat for it to feed on.

Respectfully yours,

RALPH EDMONDS.

SAVING CLOVER SEED.

From the Franklin Farmer.

The difficulties of saving the seed are imaginary; the process is simple and easy. After the clover field has been cut or grazed, let the second come on. When about two-thirds of the heads have turned brown, cut with a cradle, throwing the grass into double swaths, and cure. When cured, rake up in the morning while the dew is on, into convenient parcels for loading with a pitchfork, and, as soon as all danger from heating is obviated, get it under shelter, either in the barn, or protected in the field. Be careful not to put it away while any moisture remains in the plants; and on the other hand, don't handle it rudely when very dry, where you don't want the seeds to fall, for in that condition the heads spend freely. Having sheltered it, you may wait, if you choose, till winter affords leisure for thrashing or treading out. Sow in the chaff, as it is more certain than the cleaned seed. A bushel in the chaff will abundantly seed an acre; but we would advise the mixture of blue grass, timothy, and orchard garss with it. We shall say more of sowing, however, at more seasonable date.

The second crop produces more seed than the first, and hence the economy of the first cutting or grazing the field; though from that cut for hay, a prudent, careful husbandman might easily save enough seed for his own use. It is believed that more seed may be saved by mowing when about two-thirds of the heads have turned brown than at any other period, because, if cut sooner, too many seeds are unripe, and if later, too many shatter out of the heads in cradling and handling. If the heads break off and fall through the fingers in cradling, cover with cotton or linen cloth. Every farmer may easily save his own seed.

MANURE FROM PEAT AND LIME.

From the Third Annual Report on the Geology of Maine.

Peat also occurs abundantly in the same meadow, and by a little chemical skill may be converted into an excellent manure by means of a mixture of lime and a little barn-yard manure, or any animal matter. Thus three or four cords of the peat mixed with one cord of animal manure, and treated with a cask or two of slaked lime, will make a compost superior in value to five cords of the best stable manure alone. They ought to be placed in alternating layers, thus:

PEAT,

LIME,

ANIMAL MANURE,

PEAT,

&c.

The whole forming a regular compost heap. The chemical reactions which follow are chiefly thus:

The lime extricates a large quantity of gaseous ammonia from the animal matter, which is absorbed by and enters into combination with the peat, and is thus retained ready for use in the state of ulmate or geat of ammonia—(a most powerful manure)—and the lime becomes completely carbonated or air slaked by the carbonic acid given out during fermentation, and in this state is a proper and permanent ameliorator of the soil. The peat is converted into a powder and soluble pulp, and becomes more suitable for the nutriment of plants. While if lime and animal matter was used in excess we shall have also a considerable quantity of carbonate of ammonia, in the peat, a well known and powerful saline manure.

In case the soil is sandy, the clay marl, neutralized with lime, is the most proper amendment for it, and such is generally the condition of the fields in Saco, so that by a proper use of this marl the happiest effects may be realized by the farmers in that town.

I could quote other instances of the kind, but the above fully illustrates my meaning, and will show how favorable an influence scientific knowledge would exert in agriculture, were it more generally appreciated.

The principles which I have laid down, have been adopted by several distinguished farmers of Massachusetts, and their experience most fully corroborates the truth of the theory inculcated.

I need but appeal to the experience of one of our most intelligent farmers in Massachusetts, Elias Phinney, Esq., of Lexington, to demonstrate the correctness of the rules we have laid down, with regard to the use of peat for compost manure, or to the beautiful farm of Benjamin Bussey, Esq. of Jamaica Plain, Roxbury, where similar results have been obtained.

Lexington, January 30, 1830.

"DR. CHARLES T. JACKSON,

"*Dear Sir*:—I herewith send you a sample of my peat. I am very desirous of availing myself of the benefit to be derived from a chemical analysis of the same, which you kindly offered to make. A more intimate knowledge of the nature and properties of peat, which can be obtained only by a scientific examination of its constituent parts, would enable farmers more justly to appreciate this valuable species of land. It is from a want of this knowledge, that our extensive tracts of low meadow and swamp lands have hitherto been esteemed of little, or no value. Allow me to say, sir, that I know of no way, in which you could render a more essential service to the public, more especially to farmers, than by enabling them to convert their unproductive and unsightly bogs and morasses into luxuriant fields, and sources of wealth. I consider my peat grounds by far the most valuable part of my farm, more valuable than my wood lots for fuel, and more than double the value of an equal number of acres of my uplands, for the purposes of cultivation.

"In addition to these, they furnish an inexhaustible supply of the most essential ingredient for the manure heap. A statement of the uses, to which I have appropriated peat lands, and my management of them, though very imperfect, may serve to give you a partial conception of their value and uses, and at the same time enable you to see how important it is that the farming community should have more information on this subject.

"In the first place they are valuable for fuel. I have for twenty years past resorted to my peat meadows for fuel. These, with the prunings of my fruit trees, and the brush from my uncleared lands, have given me my whole supply. The prunings and brush are bound in bundles, and housed, and with the help of a small bundle of these faggots, and peat, a quick and durable fire is made. It gives a summer-like atmosphere, and lights a room better than a wood fire. The smoke from peat has no irritating effect upon the eyes, and does not in the slightest degree obstruct respiration, like the smoke of wood; and it has none of that drying, unpleasant effect of a coal fire. The ashes of peat are, to be sure, more abundant, but not more troublesome, and are less injurious to the furniture of a room, than the ashes of coal.

"The best peat is found in meadows, which have for many years been destitute of trees, and brush, and well drained, and where the surface has become so dry, and the accumulation of decayed vegetable matter so great, that but little grass or herbage of any description is seen upon the surface. If the meadows are suffered to remain in a wet and miry condition, the wild grasses and coarse herbage will continue to grow, and the peat be of a light and chaffy texture, filled with undecayed fibrous roots. By draining they become hard, and the peat becomes compact and solid, and the cutting out, and carrying off greatly facilitated. A rod square, cut two spittings deep, each spitting of the length of eighteen inches, will give three cords when dried. It may be cut from May to September. If the weather in autumn be very dry, the best time for cutting will be from the middle of August to the middle of September. If cut the latter part of summer, or early in autumn, it dries more gradually, and is not so liable to crack and crumble, as when cut early in summer. The pieces are taken out with an instrument made for the purpose, from two to three inches square; and if of good quality will shrink about one-half in drying. It is considered a day's work for a man, a boy and a horse, to cut out and

spread a rod square. The man cuts it out, and lays it upon a light kind of drag, made for the purpose, and it is drawn off by the horse, and spread by the boy as thick as the pieces can lay singly. After becoming dry enough to handle without breaking, it is made into piles, cob-house fashion, of from twelve to twenty pieces in a pile. It will then require about four weeks of dry weather to render it fit to be housed for use. The top, or turf, is thrown back into the pits, from which the peat is taken; and if well levelled, and the ground drained, it will, after the first year, give a large crop of foul meadow, or other lowland grass. Peat, taken from land which has been many years drained, when dried, is nearly as heavy as oak wood, and bears about the same price in the market.

"The value of peat and swamp lands for tillage, is now pretty well known, and acknowledged. Some years since, I occasionally sold to my neighbors a few rods of my peat land, yearly, to be cut out for fuel, at three dollars per rod, being at the rate of four hundred and eighty dollars per acre; but finding this sum to be less than its value for cultivation, especially when laid to grass, I have declined making further sales at that price. I have raised upon my reclaimed meadows, seventy-five bushels of corn, five hundred bushels of potatoes, or from four to five tons of the best hay, at a first and second cutting, to the acre, at a less expense of labor and manure, than would be required to produce half this crop upon uplands. To render these lands productive, they should be thoroughly drained, by digging a ditch around the margin of the meadow, so as to cut off the springs, and receive the water, that is continually flowing in from the surrounding uplands. If the meadow be wide, a ditch through the centre may be necessary, but this will be of no use without the border ditches. This being thoroughly done, and the surplus water all drawn off, the next step is to exterminate the wild grasses, and herbage of every kind, that grow upon the surface. To effect this, the method heretofore generally, and now by some pursued, is to cover with gravel or sand, top-dress with manure, sow the grass seed, and then rake, or bush it over. This, for the first year or two, will give a good crop of hay; but after this I have invariably found that the more coarse and hardy kinds of wild grass would work their way through the sand, or gravel, and entirely supplant the cultivated grasses—when the whole must have another covering, or be abandoned as worthless. If to be planted with corn, or any of the root crops, my course has been to turn over the turf or sward with a plough having a wrought iron share or coulter, ground to a sharp edge in the driest season, say in the month of September, roll down as hard as possible, carry on in the winter a sufficient top dressing of compost, twenty cart-loads to the acre, and in the spring plant with corn, or roots, without disturbing the sod. When the corn or roots are taken off, the surface is made smooth with the cultivator, or hoe and harrow, and late in November, or just before the heavy frosts set in, sow with herd's grass and red-top seed, half a bushel of the former and one bushel of the latter to the acre. The field is then rolled, which completes the process. If the plough does not turn the sods smooth, it will be necessary to follow it with the bog hoe, to level the uneven places. By keeping the sod undisturbed in the cultivation, a more firm and compact surface is formed, upon which oxen or horses may work, generally, without danger of miring. If the land is intended for grass, without the intervention of a hoed crop, the turf is turned over with the plough, as before stated, in August or September, or as early as the surface becomes dry enough to admit the oxen or horses upon it; then follow with the bog hoe, and turn over such parts as the plough has left unturned, make the whole smooth with the hoe, and late in November, spread on a top-dressing of compost, not less than twenty cart-loads, made half of loam, and half of stable manure, to the acre; then sow the grass seed, and bush, and roll down. If the ground be miry, so as to render the use of the plough impracticable, the bog hoe must be resorted to, and the whole turned over by hand, and top-dressed, and seeded to grass, as above stated. The cost of turning over with the hoe, will be twenty dollars per acre, at the usual price of labor. This mode of culture completely subdues the natural wild grasses, and gives a compact and rich surface of vegetable mould, which will give an abundant crop of the best English hay for four or five years, without the aid of more manure. If the sod is disturbed and attempted to be pulverized in the course of the cultivation, the surface, when laid to grass, will be loose and spongy—and extra top-dressing of loam and manure will be required, and after all, the surface will not become so compact, nor the produce by any means so great. Should meadows be found too soft and miry to admit of their being ploughed in the summer, or autumn, and the expense of turning with the hoe should be thought to be too great, I would advise ploughing in the spring, when the frost is out, to the depth of three or four inches, carting on the manure, and then sowing or planting at a convenient and proper season. The art of reclaiming these low meadows, consists in taking off all the surplus water by judicious draining, and in thoroughly exterminating the natural herbage and grasses. This being effected, we have our rich bottoms, equally as productive as the deep alluvials of the west, and obtained at a cost and sacrifice infinitely less.

"The third particular, in which peat lands may be considered valuable to the farmer, consists in furnishing him with a very important ingredient for his compost. Peat is made up principally of decomposed vegetable substances, with a portion of the lighter particles of vegetable mould, washed in from the surrounding highlands. But when taken fresh from the pit, it contains certain antiseptic properties, injurious to vegetation, which must be absorbed, or neutralized, by a combination with other substances, in order to render it food for plants. This may in some measure be effected by exposure to the action of the air and frost. Where the surrounding uplands are composed of gravel or sand, the peat or swamp mud may be called silicious, and is less valuable for manure, especially if the adjacent uplands rise abruptly; when composed principally of clay, the peat is aluminous—this is frequently found resting on beds of marl, and is considered much richer, and more valuable for the compost heap.

"I have annually, for some years past, used on my farm some hundreds of loads of peat mud, which is either thrown into my hog stye, or mixed with fresh stable dung, or with lime. When

mixed with green stable manure, the proportions are two parts of peat mud to one of dung; and I am confident, from repeated experiments, that a load of this compost, well mixed and fermented, will give as great a produce, and a more permanent improvement to the soil, than the same quantity of stable manure. In this opinion, I am not alone. Other accurate and intelligent cultivators, have made similar experiments with similar results.

"The vegetable substances of which peat is composed having been decomposed in stagnant waters, they have not passed through a putrefactive fermentation, and are therefore supposed to retain much of their natural oils, gums and acids. Peats, in this region, are also supposed to contain portions of sulphate of iron, or copperas, oxide of iron, &c. This opinion is formed from noticing the difference between the effect produced by using the peat mud on ground, when first taken out of the meadow, and that which is produced after fermentation, with stable manure, or by mixing it with lime. The ashes of peat have little or no perceptible effects, when used alone, but by mixing them with lime, they become a valuable manure.

"That our peat may possess other and different properties, which are in a great or less degree injurious to plants, is highly probable. These can be detected and remedied only by the aid of science. It is to the agricultural chemist, that the practical farmer must look for a developement of his resources, to remove the obstacles which impede his progress, and to impart that information which will give confidence to action, and a successful issue to labor.

"With an earnest desire that you may persevere in your useful labors,

I am, dear sir,

With the highest respect,

Your obedient servant,

E. PHINNEY."

Having, two years since, given Dr. N. C. Keep some instructions, relating to the management of peat compost, that gentleman communicated them to his father, an old and intelligent farmer, residing at Longmeadow, upon the Connecticut river; and the experimental trial having been made to his satisfaction, he politely furnishes me with the following interesting statistics:

"To CHARLES T. JACKSON, State Geologist, &c.

"*Dear Sir*:—Being much indebted to you for information in regard to the use of peat, as a manure, and the mode in which its acid properties may be not only neutralized, but made a most valuable food for plants, I beg leave to state, that in the fall of 1836, I took from my bog about three cords of peat, and placed it in a pile on the nearest solid land, in the woods. It remained there undisturbed until sometime in November, 1837. By the action of the *frost* of the preceding winter, and the heat of the summer, it had lost much of its adhesive property, and was greatly reduced in weight.

"I now brought it home, and while one was unloading, another sifted in lime with the hand, (it having been previously slaked to a fine powder,) at the rate of one bushel to a cord of peat. Lime having been thus scattered evenly through the whole mass, nothing further was done to it until about the middle of next May. Observing, after the manure had been removed from the barn yard, that a considerable quantity of water from the rains had collected itself in the lowest part of the yard, (say six or eight barrels,) I had the peat removed into it. The garnet-colored wash of the yard was rapidly and entirely absorbed. I allowed it to remain in this situation until the first of June, during which time its color had changed from mahogany to a jet black. Fermentation did not take place.

"By the successive action of the frost, lime, and the wash of the yard, the sensible qualities of the peat had very much changed. When first taken from the bog, it was pulpy and very adhesive—could be spread like butter; now it was a fine powder, having entirely lost its peculiar adhesive properties.

"I used the manure thus prepared, for squashes—planting fifteen rods of ground, very sandy and much exposed to drought. After the manure had been dropped, (one shovel full in a hill,) I sprinkled a little lime in each hill, directly upon the peat. Upon this, I planted the autumnal marrow squash. The seeds came up well, and the plants were of a healthy color. Some of the plants were entirely destroyed, and all of them badly eaten by insects; the yellow bug was most destructive. The plants, after they had recovered from this shock, grew more rapidly than any that I had before witnessed. The color of the vines, and the rapidity with which they covered the ground, were most convincing proofs to my mind that they were perfectly healthy, and well supplied with nutriment. In the severe drought which came on in the summer, these vines, for many weeks, did not appear to suffer, while others of a similar kind in the neighborhood, were dead and dying. The result was, that notwithstanding the long continuance of the drought, in which nearly all our potatoes, peas, &c, were killed, these squashes were preserved, and yielded a middling crop.

"I also used the compost, as above, on intervale land, near the Connecticut river, soil alluvial, no stones or gravel—can be easily compressed, does not bake in the sun—has been cultivated for more than one hundred and fifty years, and yields a very scanty crop, without manure. The compost was spread over the ground, and ploughed in, at the rate of nine cords to the acre of ground; thus prepared, I planted thirty rods with sugar beets—distance between the rows, eighteen inches—hills eight inches—one seed in a hill. The seeds proved bad, not more than one-third coming up—yet I had 116 bushels of beets; while above an acre of the same land, manured with the best stable manure, at the rate of twelve cords to the acre, did not produce one hundred bushels. Two rows of potatoes were planted next the beets; the land had been designed for beets, and was prepared precisely the same. Between these two rows and more than an acre immediately adjoining, (where a large quantity of best barn-yard or animal manure was used,) there was a very perceptible difference in favor of the former. I also planted a few hills of potatoes on very sandy land, in the latter part of June. Into the hills I put peat, which had been saturated with lye, from the bottom of a soap tub—no lime. The tops of these potatoes, during the whole drought, were of the most living green

and the most luxuriant growth that I ever beheld. They were killed by the frost in the fall, before maturity. The potatoes were small.

"In conclusion, I would mention, that I am so well pleased with the result of these experiments on a small scale, that I am now preparing one hundred and fifty cords of peat, and fifty casks of Camden lime, and all the animal manure I can make, to enrich as fast as possible my whole farm.

"*Expense.* I get out my peat by ox-team and cart. Three men can, in this way, get out eight cords per day, $4.00; price of lime, $1.50 per cask. My peat being three and a half miles from my barn, that portion of it which I bring home, I estimate to cost me, for carting, one dollar per cord. The peat and the lime for the compost—using one third of a cask of lime to a cord of peat—then, cost me, on the ground near the peat bog—three cords of peat, $1.50—one cask of lime, $1.50; that which I cart home, $1.00 per cord more.

"I intend to put about one-sixth part of animal manure, but as it cannot be purchased in any adequate quantity, it is more difficult to fix a price. The nearest place where livery stable manure is sold, is four miles; price there, per cord, $3.00—cost of carting, $1.50,

Five cords of peat, delivered, -	$7.50
Two and one third cask of lime delivered,	3.50
One cord livery stable manure, "	4.50
	$15.50—

divided by six--the number of cords, not estimating the increase of quantity from the bulk of the lime—gives the cost, two dollars and fifty-eight cents, delivered—or one dollar and fifty-eight cents per cord, at the peat bog.

(Signed) SAMUEL KEEP.

"*Dear Sir:*—Herewith are the facts, collected with care, at my request, by my father, Samuel Keep, of Longmeadow. My own opinion is, that a new era has begun in agriculture. The quantity of one-third of a cask of lime to a cord, was selected in the absence of chemical experiments, to determine how much was absolutely needed to neutralize the ulmic acid, because he prefers to put on ten to twelve cords to the acre—and twelve cords would take four casks of lime to the acre. If lime was as cheap as in Maine, he would probably have put in more. Not withstanding the expense appears to be great, my father feels confident that he gets a better article in compost at $2.58, than the livery stables furnishes at $3.00, with the additional cost to him of $1.50 for carting, making $4.50.

N. C. KEEP."

THE CANTON MULBERRY.

To the Editor of the Farmers' Register.

In my estimate of the comparative value of several varieties of the mulberry, which recently appeared in the Farmers' Register, the Canton occupies the third place. As its growth advances, however, it appears to be more valuable, and I am constrained to place it next to the morus multicaulis. It grows very rapidly, is easily propagated from cuttings, and its leaves are about three-fourths the size of those of the multicaulis. This mulberry I procured from Mr. J. Mason, Jr. of George Town, D. C. and by a letter recently received from him, I am informed that he has some of this variety from roots, 8 feet high, and from cuttings but little inferior. I presume they were planted on very rich soil; but its chief value in my view, consists not merely in its large leaves, but in its adaptation to poor soils. Any mulberry which does not possess the latter quality will not suit a large portion of Maryland and Virginia. My object in writing is to circulate correct information, and whenever I find that I have promulgated an error, I hope I shall always possess the frankness to acknowledge it.

LAYTON Y. ATKINS.

Stafford, August, 1839.

We had received previously from another highly respectable source a commendatory article on the Canton mulberry, which we had declined inserting, because, first, one such, to the same general purport, had before been published, and secondly, lest the piece might have been supposed to be a salesman's advertisement in disguise—which we would be unwilling should be charged against any article in this journal. A place for the foregoing piece is claimed, and of course conceded, on the ground of justice, and for the correction of previous error of the writer.—ED. F. R.

SOILS ENTIRELY OF LIME.

To the Editor of the Farmars' Register.

A valuable communication on the subject of *lime*, one of the most interesting to the agricultural community in your Register for June, has induced me to give you two *facts* relating to that species of manure, stimulant, or whatever it may be termed. The first five or six lines of the above communication induced me to believe it would be a proper moment to give them to your readers. Along the coast of the Gulf of Mexico, the bay of Mobile, and reaching up into the mouths of the rivers emptying into each, there are formed extensive *marshes*, and islands entirely so. On those marshes we frequently find, what are termed *shell banks*. Those banks are at distant periods covered with water, and a deposite of *black earth* is found more or less amongst the shell which is uniformly more or less mouldered. Some of those banks are not covered for many years, and in this case indicate but little earthy matter amongst the shell. Opposite the town of Mobile one of those banks is found considerably elevated; no person now living knows when it was covered with water. Containing about one and a half acre, it rises like an old remains of a mound. It has been cultivated for many years; when not cultivated, throws up a singularly rank grass; no spot of soil on the Mississippi or in Ohio, Kentucky, &c., can exceed it in producing *annual vegetation* of any and every plant—beets, cabbage, corn, or sugar cane. Now all persons who have examined it are perfectly satisfied that there cannot exceed *one-tenth* of *earth*, or *deposite amongst the lime* or *shell*; the last, when

put through the usual process makes the strongest lime.

In my yard stands *a mass of blocks* of that species of calcareous matter usually called here, and in Georgia, where it abounds, "*rotten limestone*," the basis of the *prairies*. On the top, and sides of this mass, which has been exposed to the atmosphere, say twelve months, and considerably *pulverized* by the last winter's frosts and the rains of the season, is found at this time a growth of the *common turnip* from one to three inches diameter. To talk of any *earth* being amongst the rotten limestone would be absurd.* Amongst the *turnips* is found *cabbage*, and the common *white mustard*, growing well. I give you the *facts* as they are seen every day; and I confess I have been induced to give them on reading communications containing *doubts* of *lime* containing any of the qualities of an actual *manure*, and especially of those who contend it has no such qualities.

AGRICOLA.

PROMISCUOUS.

For the Farmers' Register.

Theory.—Amongst my readings on farming subjects, I frequently notice objections to theory; at which I am much astonished, for without theory there can be no practice. For my own part I am equally fond of theory and practice; if the theory is good, I put into practice, and if the practice is good, I continue it.

Practice.—My practice is to carry paper and pencil in my pocket, and as an idea which I may consider of value occurs, I make notes; to which notes the public are welcome, as they cost me nothing.

Brake or fern.—In a late number of the 'Cultivator,' I noticed the inquiry "how shall I destroy fern?" which was answered "I do not know, except by eradication." There are several species of fern, some of which grow in warm climates and situations; but there are two kinds in Virginia which are considered pests, which grow only in and amongst the mountains; one a pest in the woods, and the other a pest in the fields. That which grows in the woods arrives to the height of five feet or more, and may easily be destroyed by felling or belting the trees, provided the sunshine is thereby insured; but a thorough burning would be a great auxiliary in this case. That kind which grows in fields is found about stumps, rocks, logs, fences, and branches, and if not destroyed will presently take possession of a greater space than the landlord can conveniently spare. Sheep will feed partially on this fern, although other and better food may be abundant, and I suppose it is not much disliked by any animal; now suppose brine, or fine salt be sprinkled on this fern, when cows or sheep, or both, are pastured in the field, is it not evident the fern would be destroyed? The salt alone would destroy the fern; but that the operation may cost nothing it is preferable that the cattle should have the salt, or greater portion, and by their browsing and treading assist to destroy the pest? The last mentioned grows to the height of fifteen or eighteen inches.

Bush hay.—About two weeks past I had many large chestnut trees cut down for the purpose of making hay, but a succession of rains ruined my project. I did not, however, lose my labor, for the trees were worthless, consequently their destruction was proper. In the course of a few days I intend again to try the operation, not on a large scale, neither on the chesnut, as the burs are now sufficiently large to be troublesome; but on a few young poplars and linn, growing on land which is to be cleared. The trees will lie as felled without further interruption, until the leaves appear sufficiently cured for keeping, when the twigs will be broken off by hand, and cast into small piles, to be further cured by an additional day's sun, when they will be secured in the manner of other hay. The leaves will no doubt be better hay than that of common swamp grass, and the twigs will be food, medicine, and manure. As to the quantity of such hay which may be gathered, I can, without experience only, have my opinion, and that opinion is this, that where the materials are abundant, hay can in abundance be made, at a cheap rate. In conversation with a neighbor a few days past, I was informed that he had, when a boy, seen the chestnut hay made and fed to cows, which kept them fat through the winter. When a chestnut tree is cut down, the stump never fails to bear a great profusion of sprouts, which if taken off annually and cured, would be excellent hay.

Cheat.—That wheat may become cheat, I have but very little doubt; that cheat does bear seeds and produce its kind I have no doubt; and that cheat will finally become a dwarf grass, I have but little doubt. I once saw a field of new land which had been sowed in wheat, and close grazed by horses, yield nothing but cheat. I have often cut cheat for hay, and have seen millions of the seeds vegetate and produce their kind. I have sometimes picked the large cheat and other smaller kinds, down to the common greensward, and after arranging them as 1, 2, 3, &c. would challenge any ordinary observer to distinguish between any two contiguous numbers. This year I had a clover lot completely smothered by the cheat, the seed of which was on the ground last year, which wishing to destroy I cut the cheat when yet in bloom, but I was cheated, for the seeds are now vegetating. When cut early, cheat makes a good hay, and next year I intend to cut so soon as the first bloom appears.

Ploughing.—The lower the horse or ox, the nearer is the draft to the line of direction, consequently the less power required; the taller the horse or ox, the longer the lever, consequently the less necessity for the draft being in the line of direction; but is it not evident that if either a low or high horse or ox be ploughed with, at a greater distance from the plough than is customary, (thereby bringing the draft nearer to the line of direction,) there would be advantage. I take no time to make calculations, but it seems to me, that according to the elevation of the shoulder above the plough so the power; if the shoulder could be

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* Not so. The specimens of the "rotten limestone" of Alabama, forming the general substratum of the prairie lands, which we have analyzed, contained quantities of pure calcareous earth (carbonate of lime) varying from 72 to 80 per cent., and other earths forming the greater part of the remaining 20 to 28 per cent. See 'Essay on Calcareous Manures,' 2nd Ed. p. 22.—ED. F. R.

brought to a level with the plough, or directly in the line of direction, then no power would be lost; if elevated to 45 degrees, then half power is lost; if to 90 degrees then there is no power.

Elder.—Elder is considered a great pest, but it is a good food for sheep, and so long as they stay amongst it they are secure from flies.

Improvement by oats.—I have this year turned under fallow about 25 acres of oats, a portion of which was treated in the same method last year; the yield of which last mentioned was about thrice as much as last year, and twice as much as that adjoining. The second crop is now growing finely, and if they can shortly have the benefit of two or three showers of rain I may make hay of some of the best.

Red [or earth] worms.—Nature orders all things right; hence stiff grounds are made the natural abode of the red worm. Immediately after a shower of rain, every worm bores one or more holes through the soil, and frequently comes on the surface, by which means the superabundant water is absorbed. As the water subsides the worms again enter the earth, and the air following, the grass or other crop is doubly invigorated. Man generally orders matters wrong; for instead of manuring his clay for the purpose of breeding those worms, he suffers his hogs to run thereon when the ground is wet, by the rooting of which, and destruction of worms, the ground is doubly damaged. As to the grub worm, they are the offspring of slovenly farming; and a sloven deserves all the damage they will do him.

Chinese tree corn.—From what I see and hear of this corn, the American tree corn is far preferable. The Baden corn seems to be preferable to the tree corn. The Chinese corn is nevertheless valuable when sown broadcast and cut as green fodder.

MOUNTAINEER.

August, 1839.

WHEAT ON CLOVER, AND LIMING, IN NORFOLK COUNTY.

To the Editor of the Farmers' Register.

Norfolk county, July 23rd, 1839.

I am now getting out my little crop of wheat, and have already cleaned out 118 bushels, and feel confident of 30 to 40 more, which, by the way, is a great crop for this section of country, especially, from about seven acres of land. Last year I produced from a small piece of land not exceeding four and a half acres, sown with five and a half bushels of seed exactly, ninety-two and a half bushels of good clean wheat. In sheer justice, however, to you and your works, I must say that the most credit (if there be any) is due to you and them, especially to your work on calcareous manures. After reading and studying that and some of your first numbers of the Register, I was satisfied that by lime I could make clover, with a little farm pen manure in addition; and from information derived from various sources, I learned that the practice of the best wheat farmers in this country and Europe, was to sow wheat on a clover lay; I have pursued it so far on a small scale, with complete success. For I am confident from some few previous trials, without the aid of lime and clover, the two crops I have mentioned would not have turned out more than one-third or one-fourth as much as they have now done, all other things being equal. So much for my *little* wheat crops, which I have not detailed inminutiæ. Our prospect of a good corn crop thus far is promising. In conclusion I do conscientiously and firmly believe that the easiest, cheapest and best manner or method of improving our lands, is by the aid of calcareous manures, when done judiciously.

R. W. SILVESTER.

PROFITS OF FARMING.

From the New England Farmer.

Much discussion and conversation have been had upon this subject. We do not mean to enter fully or much at large upon a subject which requires to be examined in various aspects and relations, in order that an enlightened and well-founded judgment may be made up; and especially in order that we may not lead to any false inferences of its unprofitableness, nor encourage any fallacious expectations as to any advantages, (we mean pecuniary advantages,) to be derived from it. The erroneous opinions and calculations which have been formed in this matter, have led to most painful results, to serious losses, and to bitter and vexatious disappointments. We know a gentleman who tried farming on an extensive and experimental scale, whose authority is often quoted as asserting that "in agriculture two and two do not make four." We understand it to be implied in this calculation respecting the profitable results of agriculture, or a fair return for the expenditure of labor and the investment of capital, are not likely to be verified as in the other business pursuits of life. We do not admit the axiom in any fair sense. We do not believe that it does justice to agriculture; and no small experience and some observation satisfy us, that circumstances being equal, farming would furnish as fair a compensation for labor, and as as ample a dividend upon the capital invested, as the common trades which men engage in, and and even the pursuits of mercantile and commercial life. Of course we except all extraordinary cases of good fortune, and all matters of gambling and speculation.

The returns of most crops strike one sometimes with astonishment; and would, if taken as a test, lead to the most delusive expectations. A grain of seed sometimes returns one hundred fold; and this being sown a second year, would perhaps give ten thousand fold, and so on in a geometrical ratio. Twenty bushels of potatoes planted will frequently yield four hundred bushels, that is twenty for one. A bushel of wheat sown oftentimes returns thirty bushels. A peck of Indian corn planted will often produce sixty bushels, that is two hundred and forty for one. A pound of carrot seed or of ruta baga, which costs a dollar, will produce six or nine hundred bushels of roots worth one hundred dollars. The proceeds in this case seem enormous, and yet they are constantly realized, and often, it must be admitted, at a comparatively small expense. But no confident conclusions on the profits of farming are to be drawn from such results as these. So many circumstances of abatement enter into the case, that if these are the only elements given in the case, the solution of the problem would give the most egregiously erroneous and deceptive results.

We are not to look to agriculture for any extra-

ordinary or sudden gains, as for example, like drawing the capital prize in a lottery where there are two blanks to a prize; like some successful East India voyage, where the sale of the cargo yields a net profit of one hundred per cent; or like some sudden rise in the stocks, or some monopolized article of produce, where a shrewd operation draws its thousands, or twenties of thousands, into our pockets. But that skill, experience, assiduity, and industry will, in agriculture, yield a fair, and to a reasonable mind an ample compensation, there are too many and reiterated proofs to admit even of a doubt.

As we said in the beginning, we do not design at this time to go largely into this subject, and we refer to it in particular at this time, for the sake of relating some parts of a conversation which we once had with a respectable and independent but complaining farmer in our own despised state.

This man then had a farm which was fully valued at four thousand dollars. The father, who had given the farm to the son, had begun life without a dollar, had run into debt for a large part of the purchase money, but had sometime since, while he supported his family, earned from the proceeds of the farm, sufficient to pay for it. Without any incumbrance he had then put it into his son's possesion, and now lived with him under the same roof.

Said the son, Farming is a miserable business!

But why so? Let us look into this matter. What is the estimated value of your farm?

Four thousand dollars.

Is it increasing in value?

Yes; by its favorable location, and by every improvement that is made upon it.

Do you get all the produce from it which it can be made to yield?

No, not one-third. It consists of one hundred and twenty acres. At least fifty acres of it are in wood, and a considerable portion in pasture. Besides that, I have several acres of peat bog, which might be redeemed and brought into English grasses.

What is the value of the wood land?

We supply our family with fuel, and besides this the growth of the wood and the hoop poles which we obtain from it, pays a large interest upon the current value of the land, so that we consider this as one of the most profitable parts of the farm.

Have you done any thing to improve your pasture lands?

No—I suppose I ought to. I tried one hundred weight of plaster spread upon a part of it, and the effects were visible as far as the land could be seen; but then after that, plaster rose *half a dollar* on a ton, and I thought I would not get any more. Then the huckleberry bushes and the sweet fern, and the rushes and alders have come in so that I cannot keep so much stock as I could formerly.

Have you attempted any improvement upon your bog meadows?

No—sometimes I have thought I would. My neighbor J. B. has redeemed eight or ten acres, and now gets two tons and a half of hay to the acre, herds grass and clover and red-top of the best quality, where formerly he got scarcely any thing; but then it cost him at least twenty or twenty-five dollars an acre to drain and manure it; and he will have to top-dress it at least once in five years, or it will never hold out. Then too, he has put on at least half a bushel or more of grass seed to the acre; and grass seed which I used to buy for twelve cents a pound, or two dollars and a half per bushel, is now twenty cents a pound, and herds grass three dollars per bushel. Then too, labor is so high, I cannot afford to hire.

Have you plenty of manure?

No; that is a great want. I have a bog hole where I suppose I could get two hundred loads a year, but then I should have to go more than a mile for it, and it is wet work. I have not any of the advantages which the farmers who live within six or seven miles of Boston, and can go in and buy a load of good dung whenever they want.

Do you know what these farmers have to pay for manure in Boston?

Why, yes! I have been told they have to give sometimes three to five dollars a cord at the stables. Sometimes our tavern keeper sells a few loads, but he asks five dollars a cord.

Have you a barn cellar?

No. I have often thought it would be a very good thing, and my barn is well situated for one; but then it would cost, besides what work I should do with my own team, full fifty dollars to make one.

Do you keep cows?

Yes, I keep some just to eat up our coarse fodder; but our women folks do not like dairy work, so we buy our butter and sell our milk to the milk-man for eleven cents a gallon.

Do you keep swine.

Only one or two for our own pork. We do not have any skim-milk or butter-milk for them. Besides there is no great profit in fatting hogs. They will not much more than pay for what feed they will eat. I know they will make a large quantity of manure, but then you must cart in a great deal of stuff into their pens or else they can't make any. But come! I must show you a sow I have got: she is only fifteen months old, and I sold her pigs for more than forty dollars. I suppose I shall make her weigh four hundred in the fall.

Do you raise your own grain and potatoes?

Not all. I raise about three acres of corn and about as much rye, and about six hundred bushels of potatoes. We sell hay and buy Genesee flour. We have tried wheat, but sometimes it is blasted; and it don't make white flour; and our women folks say that they cannot make handsome pie-crust or white bread with it.

How many have you in your family?

I have a wife and eight children, and my father lives with me.

Have you any trade?

No; I have nothing but my farm.

Does your farm support your family and pay your labor?

Why, yes! I have nothing else, excepting a little interest that comes from some money which I received for the sale of wood from the farm, sometime ago, which came to about five hundred dollars, and which I put out at interest. We sell enough produce from the farm to pay our hired labor, which costs about a hundred dollars per year, and our store bills and taxes.

We have very much abridged this conversation, and we shall leave it without farther comment. But here is a husbandman on a farm valued at four thousand dollars, not producing more than one-third of what it might be made to produce, yet

supporting a family of eleven persons and paying all expenses, excepting the labor and superintendence of one man, and the farm gradually increasing in value by every expenditure, however small, for its improvement; this man too, not working half the time, and he and his family living in the enjoyment of all the luxuries, if they choose to have them, which they can reasonably ask. Let such a man if he will, take his two hundred and forty dollars income and labor no more hours than he does in the country, and go into Boston and try to support his family there. The end of the year would show him a result which would make him ashamed to complain of his present condition. His whole money income of two hundred and forty dollars would scarcely pay for his fuel, his taxes, and the rent of a ten-footer. What an evil it is that our farmers do not know their blessings!

H. C.

URATE AND POUDRETTE.

From the Long Island Star.

On Thursday last the Mayor and Aldermen of New-York were invited with other gentlemen, to visit the unfinished works now erecting for a Urate and Poudrette establishment. They are situated at Lodi, New Jersey, on the flats of the Hackensack river, near the line of the Newark Rail-Road, on lands of Anthony Dey, Esq. Mr. Barthelemy, who first introduced from France this mode of preparing manure, was of the party, and together with Mr. Dey, ready to give all necessary information of the plans of the company.

The main building, situated at a good landing, and distant from any other house, is 150 feet in length, and is made water-tight, for the reception of 15,000 bushels of the material in its original state. Here it receives a mixture intended to render it in a great measure inodorous, and prepare it for the drying process. There are large drying platforms to be covered with moveable roofs, like salt works, where the material will be exposed to the sun, after draining off the liquid parts, which forms what is called *urate*. Above the main cistern are lofts for the stowage of the article in its finished and unfinished state. On the wharf are two lines of rail way inclining towards the buildings and connected therewith, to convey all articles from the deck of the steam-boat to the buildings.

We were shown on board the steamboat several tubs of which a great number are in course of manufacture. They hold three bushels each, with close and tight covers secured by an iron clasp. It is intended, if the city authorities of New York and Brooklyn shall lend their aid, to change essentially the mode of operations of the night scavengers whose very *necessary* duties are always inconvenient and offensive to the citizens. The tight tubs are to be used instead of being emptied *into the docks* as heretofore; they will be put on the deck of a steamboat, or other boats, stationed in different parts of the city, to be towed away in the morning to this great establishment at Lodi. The company are making all their preparations on a large scale and appear to have the means and the disposition to drive the business effectually.

It is difficult to conceive of any improvement combining more directly the interest and convenience of the city and country. The docks have been made offensive and unhealthy, and must often be cleared out by mud machines—the fish in the cars rendered objectionable, and thousands who live on shipboard, offended by the state of the docks. If all these evils can be remedied, and the great nuisance of the cities be *required* and *demanded* by the country, it will form a combination of benefits most devoutly to be wished." One great objection to city residences will be in a measure removed, and it will probably lead to improvements in dwellings and yards.

We have heretofore published much evidence from practical agriculturists, of the good effect of the manufactured articles. That they are portable in bags and barrels without being offensive, is also well known. There are two companies now in operation in New York, who are at variance in interest, and whose advertisements may be seen in our columns. The public are not interested in their differences, and if competition should grow out of it, probably the great community would be all the better served, and at cheaper rates. It cannot be doubted that the Common Council of New York and Brooklyn, will give every possible aid and encouragement to this most interesting branch of "*internal improvement.*"

ON THE PROPAGATION AND CULTIVATION OF THE QUINCE TREE.

From the Magazine of Horticulture.

The quince is a very beautiful tree when in flower, and when the fruit is ripe in autumn, highly ornamental. It derives its name from *Cydon*, a town of Crete, famous for this fruit; whence its generic name Cydonia.

The trees are easily raised by layers, or by cuttings, taken from the tree in April. Select a shady place in order to plant them in rows, at about a foot apart from each other, and about four inches from plant to plant in the rows; spread over the surface of the ground rotten leaves, or manure, when the planting is finished, which will keep the ground from sudden drought; also, water occasionally, if there should be a continuance of dry weather.

The year following, those that are well rooted may be planted out in May, and those that are not should remain another year. They may also be propagated by budding or grafting: and these trees will bear fruit sooner, and are generally thought to be more prolific, than those raised by any other method.

The best sort for planting is the *Portugal*, being highly prized for baking or stewing. It is of a fine purple color when dressed, and is much better for marmalade than any of the other varieties. The oblong or pear quince, and the apple quince, are also cultivated for family use; but the Portugal sort is in the greatest repute, either for cooking or preserving.

The quince tree may be pruned much in the same way as you would prune an apple tree, taking care to cut out all the old diseased and dead wood, and the cross branches in the middle of the tree, which injure each other by friction. Old trees are very apt to have rough bark; when this is the case, it should be shaved off with a draw

knife, and the stems washed over with soap-suds and tobacco water. The trees will thrive in almost any kind of soil; but grow the best in a deep loamy soil, with rather a moist bottom.

The quince tree also makes excellent stocks, on which to graft pears, in order to obtain dwarf trees; for this purpose they may be propagated by cuttings put in as before recommended. The trees may be budded the second or third year, according to the growth they have made.

This fruit is but little cultivated, and, in consequence, always commands a high price in our market: it is as easily grown as any other fruit, and does well in situations where other kinds of fruit trees will not thrive. A little more attention to their cultivation, and a very handsome profit could be realized from a limited piece of ground.

Yours, J. W. RUSSEL.

Mount Auburn, Cambridge, July, 1839.

SPECIFICATON OF A PATENT FOR MANUFACTURING SUGAR FROM BEETS.

Granted to Joseph Hurd, Jr., of the city of Boston, July 26th, 1838.

To all whom it may concern: Be it known, that I, Joseph Hurd, jr., of Boston, in the state of Massachusetts, have invented an improved mode of manufacturing sugar from beets, by which the process is so much facilitated as to enable every cultivator to perform it in his own family, with great economy and efficiency; the apparatus employed not being costly in the first instance, and the operation being carried on, principally, by means of such utensils as every farmer already possesses.

The beets, after being taken from the ground, and freed from all extraneous matter, are to be cut into slices, the thickness of which should not much exceed the eigth of an inch. I have invented a machine for the purpose of performing this operation, which is more effective than any other with which I am acquainted, and for which I have obtained letters patent of the United States. The beets are to be taken out of the ground as soon as they are perfectly matured, and are to be then stored in a cellar, or other suitable place, as otherwise they rapidly undergo a change unfavorable to the production of sugar; they are to remain in this situation until the arrival of the time for slicing and drying them. The proper period for this operation is the earliest season of frost; as, in my process, they are to be exposed to a freezing temperature, so as to freeze, and dry them in the air immediately after they are cut. This freezing is an essential point in my process; this, together with the dispensing with the use of lime, and the producing of sugar without molasses, may be denominated its characteristic features. To dry the beets after slicing them, they may be spread out upon laths, or upon netting, or in any other manner in which they will be most completely exposed to the frost, and to the wind; the desiccation, when sliced as above directed, requires but a short space of time, and is effected without injury to the saccharine principle. After being thus frozen and dried, the subsequent steps of the process may be performed at any time, as not the slightest injury will result from keeping the beets in a dry state for any length of time.

When it is desired to proceed to obtain the sugar from the beets immediately, they may be subjected to the freezing process only, then thawed, and submitted to pressure; they will then readily yield the greater part of their juice, which they would not have done if pressed prior to their being frozen. The pressed slices, with the residuum of the sugar contained in them, may afterwards be dried, and kept as food for cattle.

When the sugar is to be extracted from the dried beets, which may be done at any season, they are to be steeped in pure water, which will take up all the soluble matter, an effect consequent upon the change produced in the beet by freezing. The quantity of water need only be such as shall suffice to cover the beets, and may be about one-half of that which was lost in the process of drying. The soluble materials consist principally of the sugar, the mucilage, and a portion of coloring matter. To free the sugar from the mucilage and coloring matter, I generally acidulate the water before pouring it upon the dried beets, by adding to it a minute portion of sulphuric acid; the quantity of this cannot be easily designated, otherwise than by observing that it shall be no greater than shall suffice to render the acid taste just perceptible. Sometimes I add the water alone, and after allowing a sufficient length of time for it to take up all the soluble matter, which may be from three to four hours when cold water is used, but a much shorter period will suffice with hot water, I drain off, and press out the solution from the residual matter, and then add thereto the sulphuric acid, as before directed. In the former mode but little of the mucilage and coloring matter is taken into solution; in the latter, they are precipitated, or so far disengaged from their combination with the sugar, that they separate in the form of scum, and are readily removed when the liquid is boiled.

The liquid thus prepared, is to be put into a boiler, and placed over a fire, a portion of the white of eggs, or other fining, being added. When brought to a boiling heat, a scum will rise, which is to be removed after damping, or taking the kettle from, the fire, which is to be repeated as long as any scum rises.

The next operation is to filter the liquor through animal charcoal, (ivory or bone black.) A stratum of two or three inches in thickness will suffice for every useful purpose, when the previous preparation has been used as above directed. The sirop will come through perfectly fine, and nearly as colorless as water; there will, however, be a very slight yellowish green tinge, resulting, apparently, from the presence of a peculiar principle in the beet; this material separates when crystallization takes place; although its quantity is minute, and its weight scarcely appreciable, it will, if left among the crystals, occasion an adhesion of the particles, and a tendency to deliquescence; it should therefore be got rid of, and this is easily effected. All that is necessary is to pour a quantity of white sirop upon the crystallized sugar after it has been pressed, so as to moisten it throughout, and then press it again. This operation requires but little time, and should be repeated until the sugar is fit to pack.

The evaporating of the water from the sugar, preparatory to its crystallization, may be in great

part performed over an open fire without danger of injury; it may be completed by placing the evaporating pan in a vessel of water kept at about 150° of Fahrenheit's thermometer. When this is performed early in the season, or by taking beets which have been frozen and dried at the proper time, there will not be the smallest portion of molasses produced, the whole of the sugar being crystallizable. In very cold weather, a large part of the water may be removed in the form of ice, by allowing it to freeze, and much labor and fuel be thus saved.

When the clarified sirop is sufficiently concentrated, small brilliant crystals will appear upon the sides and bottom of the vessel, and a crust soon forms over the surface of the liquor; the crystals go on increasing in size, and that portion of the sirop from which the air is excluded continues in a perfectly clear and liquid state; but if the sirop be at this time stirred, it becomes opaque, and of milky whiteness; a deposition of fine white sugar then takes place, and whatever of impurity may have remained in the liquor will rise to the surface; this portion crystallizes more slowly than the other, but by drawing it off, and again exposing it to heat, it will readily form good sugar.

Having thus fully described the process which I have devised for the manufacturing of beet sugar, I do hereby declare, that what I claim as my invention, and desire to secure by letters patent, is the preparing of the beets for the subsequent steps of the process, by exposing them, in thin slices, to the action of frost, after which they may be directly thawed, and submitted to pressure; or they may be dried by a current of cold air, and treated in the manner set forth, at any convenient time; it being always observed that when the process for the extraction of the sugar is commenced, it must be completed without delay, as upon this depends the ability to produce the sugar without molasses, and without the employment of lime to correct acidity. JOSEPH HURD, JR.

The foregoing specification promises much for the benefit of sugar-beet culturists, and we earnestly hope that it may perform all that is promised. Nor are our wishes for the success of this new industry made the less earnest, because it will be best prosecuted under the climate of the northern states, and may not be profitable in the south; or because one strong ground for urging the culture, by some, is not so much to benefit the northern agricultural interest, as to injure that of the south. However, we welcome all real improvements, without regard to the motives for introducing them, or to what portion of our great territory may receive the benefit.

But however beneficial the mode described above may be, we cannot understand upon what ground can be claimed for it the privilege of being secured by a patent right, which would not equally apply to any other improved and profitable process in agriculture or domestic economy. It seems to us that at least as good ground of claims for patent rights might have been presented by Gideon B. Smith (for example) for the use of his discovery that multicaulis trees could be propagated by small cuttings—by Mr. Herbemont, for making wine by adding sugar instead of spirit—and by hundreds of other discoverers of valuable agricultural improvements. According to this view, the editor has lost the chance of gaining some hundreds of thousands of dollars by failing to secure a patent right for directing and *permitting* the manuring with shell marl; and also the chance of thereby giving a ten-fold greater impulse to the improvement of the soil, inasmuch as most persons will eagerly *buy* instruction, which they will not accept or profit by, when offered to them, and urged upon them, *gratuitously*. Therefore, (and waiving all claim to profit individually by the new application of the principle,) it is important to agricultural and general interests that it should be known what agricultural improvements may and what may not be secured by patent right privileges, and which may thereby be made commodities for market, and the subjects of profitable sale. If acted upon universally, the mode would be at least fair for all individuals concerned; and better for them and the public, if bought knowledge and improvements continue to be sought and prized far above what is given without expectation or desire of remuneration. Then, in addition to buying the right of using improved machines and implements to execute certain processes, we shall sell and buy the right to execute the processes themselves, whether they be for such humble objects as the more economically feeding silk-worms, preserving potatoes or pumpkins, or harvesting corn, or for such important improvements as may change the face and double the products of agriculture, through extensive regions. Then, too, agricultural journals will change their character, and become far more profitable to their publishers. For instead of publishing articles of instruction, obtained at the publishers' cost, and which few persons now care to read and profit by, they will be filled with paid advertisements and indirect puffs of the same purport and object, but the printing of which will be a source of immediate and direct profit to the publisher, instead of being at his cost.

SWINE IN A FRUIT ORCHARD.

From the Genesee Farmer.

Mr. Phillips, in a letter published in the Memoirs of the Pennsylvania Agricultural Society, thus speaks of the beneficial results of allowing swine to run among fruit trees:

"For several years past my family have been supplied with the finest plums by a neighbor, who is the only person I know of who has had uniform success with them. Last year while his trees were in full bearing I carefully examined them particularly as respected their culture and local situation, and I found that no uncommon pains had been

taken with them, on the contrary they appeared neglected, as numerous dead and broken limbs hung about them; and that the very great success he had, could only be attributed to their situation which was at the place where the hogs lay and were fed. He told me that the hogs never let a plum remain, that had fallen, many minutes undevoured, and thereby destroyed the insects that hung about, and the larvæ in them, and that of late very few insects had appeared about the trees."

We can bear testimony to the efficacy of swine in fruit orchards, in destroying the curculio, or the insect that so much injures the plum and the cherry. We have two cherry trees standing where pigs lie, and are fed, and though not as favorably situated as many others on our premises, in other respects, they uniformly produce the finest cherries grown on our trees. After the cherries begin to ripen, there are few hours in a day in which the trees are not visited by the pigs, and every worm, stone, and cherry, are at once disposed of. On our other trees, the curculio, does much mischief annually, on these the fruit is nearly exempt, and is decidedly larger and fairer than on those to which the swine have no access. In planting plum or cherry orchards, this fact should not be forgotten; and pigs should have the free range of such premises.

INTRODUCTION OF THE MORUS MULTICAULIS LONG BEFORE ITS DISCOVERY BY PERROTTET.

There have recently been published several communications of the remarkable, and to most persons the incredible fact, that the morus multicaulis has been growing in Craven county, North Carolina, unnoticed and unknown, for about half a century; or for some thirty years earlier than the importation of the tree from the Phillippine Islands to France, by the botanist Perrottet—which, until this late contradiction, had been admitted generally (and in this country universally,) as the earliest introduction of the plant from Asia. The most full account of the North Carolina growth is given in a communication to the last number of the 'Journal of the Silk Society,' by George Wilson of Newbern. Mr. Wilson describes the plant from actual inspection, as it appears, and vouches for its identity with the morus multicaulis; and he states, from the information of others, the account of the origin, which we will here condense. He reports that a Frenchman, named Fonville, emigrated about fifty or sixty years ago, and settled in Craven county. He brought with him mulberry plants and silk-worms' eggs, for the purpose of prosecuting silk-culture, but which was prevented by his death occurring not long after. The mulberry trees, which he planted, being no longer valued or protected, and being in cultivated land, have been gradually disappearing, from being cut and grubbed, and burnt over, until but one root remained, which was lately rescued and removed by Daniel Lewis. "Until within the last twelve months" adds Mr. Wilson, "we never heard of the multicaulis here, but one individual, who had bought six of them, about three years since, of Prince of Long Island, and has nursed them up to 1500. A speculator came along, and bought them up at 35 cents, and spread among us the importance and the name of the tree. Then it was that Lewis said that he knew where some of the same trees grew, and he went, in company with a man named Gooding, and procured those of which I have already informed you."

It is not our object at present, either to affirm or deny the correctness of this recent statement. It is more than probable that there has existed some source of mistake, unknown both to the writer of the communication and to those from whom he derived his information. But whether that supposition be true or not, we can make manifest the *possibility* of the morus multicaulis having been brought from France fifty years ago, from indubitable evidence in our possession of the fact that the tree was growing in France some years still earlier; and that, though preserved and propagated by a few curious cultivators, merely as a rare plant, it remained unnoticed by all other persons, and scarcely known, until in 1834, the date of the report on the subject which we shall give below. *If it should be proved* that the growth referred to has really been so long in North Carolina, and is the true morus multicaulis, (neither of which is yet *established,*) than this publication will serve to clear up the otherwise mysterious and incomprehensible fact of the early introduction. The report below is a translation from the original which is in our possession, and may be found at page 350 of the '*Annales de l'Agriculture Francaise,*' for 1834.

"*Report of M. Jaume Saint-Hilaire to the Royal and Central Society of Agriculture.*

Sitting of June 18, 1834.

In a journal of Lyons, which M. Huzard, the father, has communicated to the society, M. Henon, Director of the Royal Nursery of that city, announces that the morus multicaulis has been cultivated for many years in Vaise, near Lyons, in the nursery of M. Nerard, nursery gardener. His father had received it from Rast de Maupas, before 1809, since which time he had lost, by a severe winter, part of those he had. Not having deemed the multicaulis preferable to the ordinary white mulberry for feeding silk-worms, he cultivated it merely as an ornamental tree, suitable to display in masses, and in English thickets.

M. Seringe, professor of botany at Lyons, adds, in support of this annunciation, a manuscript note of Madiot, who for a long time was the director of the royal nurseries. This note is in these words:

"The mulberry tree which is said to have been brought from the Philippines by M. Perrottet, is a tree of the second degree of size, which I met with in 1800 in the nursery of M. Nerard the younger, at Vaise. This same variety has yielded fruit for more than fifteen years at the Acclimating Nursery of the Rhone."

M. Henon declares that he had seen at Ecully, in the garden of Rast de Maupas, the mulberry tree from which had been propagated those of Nerard. This tree, as well as many foreign oaks and walnuts, has been cut down since the death of the proprietor.

The statement in the Lyons journal was supposed to have been founded on a mistake of the species, and that the trees reported to be the multicaulis were some of the varieties of either the white or black mulberry, or the Italian. The Society [*Royale et Centrale d'Agriculture*,] having charged me to examine and report on this subject, I have assured myself of the identity of the species cultivated at Lyons with that of the *Jardin du Roi* of Paris, brought by M. Perrottet. I have asked for and obtained specimens, and have now the honor of exhibiting them to the society. They are as follows:

No. 1, is the morus multicaulis of the school of the *Jardin du Roi*, imported by M. Perrottet;

No. 2, that of the mulberry of Lyons;

No. 3, that cultivated at M. Nerard's at Vaise;

No. 4, that of M. Seringe;

No. 5, that of Messrs. Audibert of Thonville.

It would be difficult to find distinct characters among all these mulberry trees, or believe them to be other than the same species. If the season had been suitable, I would have been able, to complete the conviction, to produce the flowers and fruits; but I believe that this additional proof is not necessary, and that we may rest upon the testimony of the able botanists and zealous cultivators, Messrs. Seringe, Madiot, and Henon.

Nos. 6, 7, 8, 9, 10 and 11, are samples of other mulberry trees cultivated in France, and in the *Jardin du Roi*. They all differ from the morus multicaulis.

Knowing that Poivre, the able and upright administrator of our possessions in India, had made many voyages to China and to Cochin-China, and that he had constantly been occupied with the culture and naturalization of useful vegetables, I had supposed that it was he who had first introduced the morus multicaulis in the neighborhood of Lyons; and I was confirmed in that opinion, when I afterwards learned that Rast de Maupas, who cultivated this tree at Ecully, and who gave it to Nerard the father, had been the physician and intimate friend of Poivre. Favorable circumstances perhaps will furnish me with positive proof of this; and that if M. Perrottet has introduced this tree into France about fourteen years since, that Poivre also had brought it forty or fifty years earlier. He was long the governor of the Isle of France, where he bought of the Indian Company a piece of ground called Montplaisir, of which he made a magnificent garden, in which he brought together the useful plants of the two hemispheres. This garden, long after, as a traveller has stated, was considered one of the wonders of the world. A philanthropist as well as a ruler, Poivre did not neglect plants which had no other merit than their novelty; but he principally fixed his attention and lavished his cares upon the plants of known utility. When afterwards retired at Freta, near Lyons, he founded there a collection, drawn from the four quarters of the world.

It is unfortunate that after the death of Poivre, his garden did not find in his successor a zealous cultivator, to preserve and especially to spread abroad the plants which Poivre had collected. The person who propagates a useful plant, makes its value known, renders it popular and brings it into general use, merits as much the gratitude of the society, as he who may have merely introduced it from its remote native region. Thus the potato had been known in Europe and in France for two centuries, without any benefit to the people; whilst that in the last forty to fifty years, that by the zeal of Parmentier, and since by our fellow members Sagaret and Vilmorin, this vegetable has been disseminated and cultivated in almost every part of France, introduced into every household, and even upon the tables of the rich, France has not suffered the terrible scourge of famine which, twice or thrice in each century, had before afflicted the nation. JAUME SAINT-HILAIRE.

It can scarcely be supposed that a committee chosen by the most distinguished agricultural society in France, and the society also, with the specimens before them, could be mistaken as to the identity of the several trees with the morus multicaulis; and the publication of the report, without objection or contradiction then, or subsequently, from any quarter, is sufficient confirmation of the judgment of the committee. But though the fact is well worthy of notice, as a matter of curiosity, it serves not in the slightest degree to diminish the merit of Perrottet, the subsequent (and as he himself, thought the earliest) discoverer and introducer of the morus multicaulis into Europe. And neither would the fact (if true) of Fonville's having brought one of the then new plants to North Carolina, among his other species of mulberry, and its progeny having lingered through half a century of neglect, and ignorance of its kind and value, detract in the least from the credit due to those who have made the value known, and thus caused the extensive propagation of the tree in Europe, and still more in this country. It was our having taken this view of the subject which prevented the bringing before the public at an earlier time the report of M. Saint-Hilaire. For though we went zealously and fully into the controversy as to the introduction of the morus multicaulis into this country, it was to transfer the award of merit from where it had been misplaced, to where it was justly due; and to decide the question as to who had disseminated this plant and extended its culture with a knowledge of its value, and not merely as to who might have been the first importer *by chance*, or one of the earliest possesors, also by chance, and in ignorance of its value, or without showing any zeal, or making any effort, to

extend the culture, except as, and when afterwards it became, an article of very profitable sale and speculation. In our appeal on this subject (p. 497, vol. vi,) designed to show that the great merit of public service in this respect, was justly due to Gideon B. Smith, and not in the slightest degree where assumed, (and in the latter case we affirm that there was no more claim for the first importation from Europe than for the after dissemination,) we should have passed over all consideration of the importation from abroad, as immaterial to the argument, but for the merit of the importation, as well as the after and gratuitous distribution, being assumed by a person having no ground whatever on which to found such broad pretensions. But let the honor due be awarded to *all* who have any *just claim*, either to discovering, or making known the utility of the plant, and spreading its propagation with disinterested and philanthropic views, as well as to those who,though merely as intelligent and curious observers, were induced to select and introduce the plants from remote countries. Among the latter, without abstracting any thing from the credit justly due and heretofore awarded to Perrottet, there is ample room for the intelligent and zealous Poivre, and also for Fonville, should the claims for his importation be established.

ON COTTON LICE, AND THE MEANS OF RESTRAINING THEIR RAVAGES.

To the Editor of the Farmers' Register.

Greene county, Ala., July 16, 1839.

I see you state in the Register that you are of opinion, that limed land will grow the morus multicaulis more luxuriantly than the unlimed. You are correct; on my sluice (called here slue,) and hammock lands, which is very black, and containing about 55 per centum of lime, the native mulberry here abounds, and its leaves are larger by a third than on the unlimed land; and in the spring when they start, they grow with a rapidity unknown to me before.

We have again this spring been visited by the lice in our cotton, though the spring being early, dry and hot, but little injury has been sustained, and at this time our crops are *very* promising. Various opinions are entertained and expressed of this insect, and the method to be pursued to avoid its ravages. To me it is obvious that if they be not the ant, the two at least live in a state of harmony together, and are always seen together. I believe them to be the ant arrived at the medium between the crawling and flying ant, brought up from the earth and deposited on the underside of the cotton leaf, by the crawling ant, the juice of which the suck; they there undergo a kind of moulting, come out winged about the size of a gnat, the wings jutting back like the locust, and they then fly off. To prevent their ravages, various remedies are proposed; the principal opinion in this neighborhood is late planting—but from this, as a general rule, I differ. I believe our cotton land should be bedded in January and February, and ploughed deep with a turning plough; whereby a great many of these insects will be turned out of their winter quarters and destroyed. Second. The planting should be regulated by the spring, if open and warm, and a prospect of continuance, plant early, viz. 25th to 30th of March; but if the spring be wet and cool, or simply cool, wait until this subsides, even if to the 10th or 20th of May, for if the cotton comes up in this kind of weather, it will not grow off, and the ravages of the insect which are peculiarly severe in every cool spell, will destroy the crop before it can grow off. Third. When planting, open the beds with a common shovel plough of ordinary length, sow down the cotton seed in it, and in three days begin to cover the seed by throwing on two furrows with the same kind of plough; as soon as the seed begins to sprout and come up, harrow or *board off*. By this mode of planting, there is more or less destruction of these insects at planting, covering and boarding off, the cotton comes up on a clean bed, and will grow off speedily if the weather be warm.

We who live in the prairies, feel a great want of knowledge in preserving our butter during summer for winter use; for generally we are without milk or butter. Our milk cows usually wean their calves in the fall, and calve again in the spring. Such information in the Register, would no doubt be highly useful. I saw a receipt for salting butter 3 or 4 years ago in the Christian Advocate and Journal, published in New York. The receipt directed rock salt ground, loaf sugar and nitre, but the proportions and quantity used to the butter I have forgotten, the paper being unfortunately destroyed. Will you be so good as to procure it, and insert it in the Register?

T. DE GRAFFENREID.

The particular paper referred to above is not at our command; but it is probable that the receipt contained was no better, and resting on less authority, than any of the different directions for preserving butter which have been published in various parts of the volumes of the Farmers' Register, and which may be readily found by our correspondent. But, if we understand his expressions correctly—that on his rich calcareous soils, (which of course ought to be good grass-growing land,) they are generally without milk and butter through the winter—there must be other deficiencies in dairy management much greater than merely not preserving the summer butter for winter use. The latter is indeed highly important, and especally for sale at remote markets; but with the great advantages offered, in soil and climate, to a cultivator on the Alabama prairies, he ought to be well supplied with both milk and fresh butter through the short winter of that fertile region.

ANTI-SEPTIC EFFECTS OF LIME WATER.

From the Farmers' Cabinet.

The Mechanics' Magazine having just arrived from England. I extract from it the following letter

on the preserving of wood by lime water. The Cabinet already contains some information on this subject, but perhaps, it would be well to show that the experience in England agrees with that of our own country. The most likely way, in my opinion, to bring it into general use, would be for some industrious person to take out a patent for it, and sell out state, county, and township, as well as individual rights, to use the process;—say charge each and every farmer five dollars for the privilege of steeping his posts in lime water, and it would soon become universal; some would pay the fee, and others would make a merit of evading the pretended patent right. The old folks would affirm that there was nothing *new* about it, that they knew it before the patentee was born, though they had omitted to try it themselves; and the young ones would shrewdly suspect that it did not differ much in principle from the well known practice of white-washing. Z.

Preserving wood by lime water.

Sir,—I some years ago called the attention of the readers of your instructive periodical to Sir Charles Steward Menteith's, (of Closeburn, Dumfrieshire,) simple *unpatented* method of preserving timber; I think it so valuable a process that it cannot be too often published. It is as follows: after cutting the timber to the size it will be wanted, it is steeped in a pond of lime and water for a fortnight, or more or less time, according to the size of the wood. Sir Charles has now some farm buildings on his estate, the timber of the roofs of which is the common young Scotch fir, but having undergone the *lime-water* process, it is as sound, after a lapse of forty years, as the day it was put up; the same timber, under ordinary circumstances, and in similar situations would rot in from three to seven years. The carpenters find, in working the wood thus treated, that the edges of their plane-irons soon become dull, and on examination, it is found that the acid contained in the wood is crystallized by combining with the alkali of the lime.

Yours faithfully,

ARTHUR TREVELYAN.

Wallingtone Newcastle, Tyne,
7th of May, 1839.

CULTURE OF BROOM CORN IN SALEM, N. J.

From the Farmers' Cabinet.

Your letter of the 20th July was received on the following day, asking information respecting the cultivation of broom corn, and the quantity raised on my land per acre. In answer thereto, I say that my land is a loamy soil, and in good condition, producing generally about sixty bushels of Indian corn per acre—of wheat from twenty to thirty—and of barley from thirty to fifty.

My usual method is to cart out all my manure from the barn-yard through the winter and early in the spring, so that the greater part thereof is upon the fields by the time the plough can be put into the land. The cultivation of the broom corn by Mr. Brown (the paper you say heretofore sent to you being lost, giving an account thereof) and by him attended to until the brooms manufactured by him were sent to market, amounted, according to his estimate furnished me, to $96 50. While in conversation with him, he drew from his pocket a paper containing the following words:—"Was raised on eight acres of land, the property of Robert G. Johnson, broom corn that made four hundred dozen of brooms, that weighed one and a quarter pound each. Many of the stalks measured sixteen feet six inches in length, and produced four hundred and thirty bushels of seed.

ISRAEL E. BROWN."

I would observe that I commonly manure my land at the rate of from thirty to forty loads per acre—such was the dressing the land got previous to the planting of the broom corn. The land being in high tilth, produced, from careful attention, a most luxuriant crop of stalks; I think they must have averaged from fourteen to sixteen feet in height throughout the whole field. I have not been inclined to encourage the rearing of the broom corn more than a sufficiency for family use. I consider the broom corn a much more exhausting crop to the soil than any other grain. There appears to be an oleagineous quality peculiar to it, and somewhat analogous to flax seed, which in my judgment has a tendency to produce the impoverishment of the soil. The seed makes excellent food for hogs and cattle.

Its nutritious quality may easily be discovered from the fine color and taste which it imparts to butter from the cows which are fed on it. The best way to use the grain is to grind it with a portion of oats—say about one-third of oats to two-thirds of the seed. Indeed it is so hard and flinty that it should always be ground before feeding it to any kind of stock.

Good broom corn seed weighs about fifty pounds to the bushel. Its value compared to oats may be considered as about half as much again; so that should the market price of oats be, say twenty-five cents per bushel, the broom corn seed would be worth thirty-seven and a half cents.

Brooms.

I think there is a difference of twenty-five, if not thirty per cent. in the quality of brooms sent to market, from such as I generally use in my family. I always endeavor to procure from the manufacturer, and for which I pay him an extra price, such as are made from the stalks before the seed ripens on them. A broom made from such tops will last much longer than one made from the ripe brush. But the peculiar excellency of the broom consists in its fibres being more soft and elastic, and performing the act of brushing or sweeping, similar to the brush made of bristles, without injuring the carpet if used prudently. After the broom shall have been used in sweeping the parlor, and the finer parts worn away, it will then be as good to sweep the other parts of the house, as the best new broom made from the ripe corn. Ladies who set so deservedly such a high value upon their beautiful Turkey and Brussels carpets, should purchase none other than such as are made from the unripe brush. The broom made from such may be easily known by the color of the straw, which is that of tea or sage; the fibre or straw is much finer and of a softer feel than that of the broom made from the ripe corn—the color of which is red, or inclining to red.

Yours very respectfully,

ROBT. G. JOHNSON.

THE MORUS MULTICAULIS CROP AND PRICES.

Though many of our readers are perhaps weary of this subject, there are many others who would deem it a most culpable omission in our publication, if they were not kept apprised of the general state of the market for this new agricultural product, and important commodity of trade, and subject of speculation. We have not designed to offer frequent or very minute reports. To do that, would require a publication for that purpose alone—and such a one already exists, in 'Morris's Silk Farmer' of Philadelphia, which is a little weekly sheet devoted to this subject, and which every person interested in the sales ought to have. The establishment of such a publication is one of the most striking features of this very remarkable mulberry speculation; and a file of the 'Silk Farmer' will present hereafter a curious and copious record of speculation statistics, and of current opinions on the subject. Our own reports on this subject must necessarily be comparatively very short, and given at distant intervals. We have endeavored not so much to give the strangest facts, or the most recent news of prices, as the general and undoubted condition of the market, and well considered and correct opinions. Of course we must be always in the rear of the latest accounts.

The opinions expressed in our last report on this subject, given two months ago, (at page 381,) have been fully confirmed by the events, so far as known, and to this day. There have been some fluctuations. Prices advanced more rapidly in July than we expected, and early in August, there was something of reaction in Philadelphia, (the great mulberry mar',) and some decline of prices in the case of particular holders who were either very timid, or compelled to raise money. The general pressure in the money market necessarily affected mulberry sales and speculators, as well as in regard to stocks of all kinds, and all subjects of speculation. Still no sacrifices (on previous prices) were made by any except some small cultivators and holders; and we have heard of no sale of any description made at less that a considerable advance on the prices of July 1st; since which time there has been, on the whole, a general and sound increase of the actual prices paid or contracted for. At that time, 50,000 trees, a part of our own planting, (on Coggin's Point farm,) were sold for 25 cents; and crops growing in and near this town, not of better growth, have been sold within the last 10 days at prices ranging from 30 to 40 cents, and to persons who purchased to plant, and a part resold at 50 cents.

We have, at no time, been so sanguine as most other persons in regard to the prices of this year; still, we have attached no importance to the recent depression, with some panic, in the market, and consider that it has already nearly passed away, where it originated, and had been most felt. Through the country generally, it has not been felt at all, and scarcely heard of; though exaggerated rumors in some quarters caused alarm, and, consequently, offers were made to sell at reduced prices. The little effect produced by the decline of demand, and the consequent *panic*, has served to increase our degree of confidence in the demand, and in present prices, at least, being steadily maintained. The real demand, for cultivation, has scarcely yet commenced, and indeed it is too soon to buy any crop months before it is ripe. The speculative demand started too soon, and advanced too fast, and therefore was necessarily checked by a pressure which bore heavily on the whole trade and moneyed transactions of the country. It is perhaps out of place here to discuss a state of the market which is already passing away where it originated. But the first news of it, and that much exaggerated, may yet be slowly reaching our distant readers, and may render this statement of some utility to them. For ourselves, (though we may be as liable to mistake as others,) as at present informed, we would not take less than the average price of 50 cents for our remaining trees, grown from cuttings planted this year—which price, indeed, would be less than half a cent a piece for the buds thereon.

DESTROYING LICE ON CATTLE.

From the Maine Farmer.

Mr. Jabez Besse Jr. of Wayne informs us that he recently tried an experiment for destroying lice on cattle, which was very successful. He took old beef brine, made of salt with a little salt-petre, and put it on the backs of his cattle, and it destroyed both lice and nits. This remedy has no bad effect on the cattle, as tobacco and some other applications for lice have, but on the contrary the cattle like it; it tends to make them peaceable, as they will stand and lick one another with apparent satisfaction.

The remedy is simple, cheap, and easily obtained, and well worth the consideration of those troubled with lousy calves or cattle. R.

DAILY VALUE OF SUNSHINE.

From the Genesee Farmer.

The value of the agricultural products of the United States cannot be less than $500,000,000 annually. The perfection of this is depending on the weather of four months, June, July, August and September, or about 120 days. Every one knows that without sunshine the crops would be a failure, either partially or totally; and hence we can estimate its average daily value at about *four millions of dollars daily*. There can be no doubt that, considering the nature of the previous weather, the beautiful days preceding the 20th of July added from ten to fifteen millions daily to the value of our agricultural products; yet like many other good things, the very commonness of this invaluable and powerful agent, causes it to be overlooked, and its results undervalued. Without sunshine the earth would soon become another chaos, destitute of order. "without form and void."

EXTRACTS FROM THE EDITOR'S PRIVATE CORRESPONDENCE.

Matthews, July 18, 1839.

The season so far, has been very favorable for corn. I think the wheat crop in Virginia will fall very far short of expectation; I have just sent mine to market.

—

Rockbridge, July 19th, 1839.

Our harvest is closed, the fields are literally studded with shocks of grain, being the most abundant crop ever cut in the county; in some sections the wheat is slightly injured by the smut. Corn and clover have suffered from drought, but it is now raining, and which makes the prospect of a corn crop flattering.

—

Albemarle, July 31, 1839.

My lime improvements have completely succeeded, and I have now a very productive farm, where there was before nothing but a dreary gullied waste.

—

Lynchburg, Aug. 17*th*, 1839.

Crops in this and the contiguous counties are extremely promising. Indian corn is nearly matured, and will be very abundant. The crop of tobacco is uncommonly early, and will, I think, be nearly secured by the twentieth of September. Scarcely any disaster can prevent the quantity from being large; but the season during the next thirty or forty days must determine whether the quality will be good. The crops of wheat and oats, which have been secured, are abundant, and of fine quality. Upon the whole, it promises to be one of the most fruitful years we have had since 1817.

SEASON AND CROPS.

The unusually favorable season has continued, without any exception, save the disadvantage which is so unusual in this month, of there having been too much rain. The excess has not done visible injury to growing crops; and, on the contrary, has added to the general vigor and luxuriance of vegetation. But, though a good crop of corn is now sure, still we do not believe that the produce will equal general expectation. We rest this opinion less on actual observations (which have been very limited,) than our general opinion that a season wetter than necessary, produces stalk and leaf in quantity out of proportion to the grain; and this will be found true as to all grain crops, and at all times.

The ravages of the chinch-bugs, which were expected to be so extensive and destructive to the corn-fields, after the wheat and oats no longer afforded them food, have done comparatively but little general injury. It was not that these insects did not pass, as usual, and in immense numbers, to the corn-fields, but the quantity of rain kept them in check, and also gave such vigorous growth to to the plents, that they were enabled to withstand the draught made by these devourers.

Tobacco is very luxuriant and well advanced. Cotton has almost ceased to be a field crop in this region, and we have no information in regard to it. The earth has been all this month softened enough for ploughing fallow for wheat—which is an advantage rarely enjoyed in lower and middle Virginia.

AGRICULTURAL CONVENTION OF SOUTH CAROLINA.

We rejoice to see that an agricultural convention for the state of South Carolina, is to be held in November next. If zealously and efficiently carried through, there is no initiatory measure more likely to render service to the declining agricultural and general interests of South Carolina; and no state in the confederacy needs such aid more, or is better fitted, by the offered bounties of nature, to profit by the first efforts, and what we hope may be the consequences of the action, of a properly operating agricultural convention. In referring to the means for resuscitating, and giving new and heretofore unknown vigor to the soil of this state, (or at least a large portion of it,) we allude principally, though not exclusively, to her immense and as yet untouched and profitless beds of fossil shells, or marl, which alone would serve, if judiciously and properly availed of, in a few years to increase the gross products four-fold, and the net product ten or twenty-fold, of all the region underlaid with this calcareous deposite. And we firmly believe that this immense amount of improvement, and of created wealth, might be secured, by an outlay of annual expense not greater than the actual cost of removal annually incurred by the thousands of emigrants from South Carolina, who are continually deserting her in her decay, to seek more fertile lands in the new south-western states. This declaration will probably be deemed ridiculously extravagant. Nevertheless it is our firm belief, founded upon large experiment and very extensive observation of the use of calcareous manures in the similar region of lower Virginia—though applied there as yet very insufficiently, and generally injudiciously, in almost every case. *Where marling begins, emigration ceases.* We are not among the adventurous class of speculaters, or of those who are willing to exchange a certain benefit in hand, for the chance of a much greater one in prospect. Yet—if it were possible to try the chance—we would not hesitate to exchange all the possessions that we have yet acquired, and our labor for the next twenty years, for the one-hundredth part of the *net profit* which South Carolina alone would gain by the judicious, economical, and general use of marl, after the mode, and in accordance with the theoretical views, which we have tried so vainly (or at least with such limited influence,) to impress upon the great agricultural public.

MONTHLY COMMERCIAL REPORT.

For the Farmers' Register.

The news lately received from Europe is of a less favorable character than had been expected. The continued demand in England for specie to pay for grain, which it was supposed would have ceased, or been substituted by exports of manufactured goods, continued to render money scarce, and kept up the rate of interest. A long continued spell of wet weather created apprehensions for the grain crops, and until these are allayed, business cannot resume its regular course. Should there be another bad harvest the increased price of grain in this country for export to England, will be by no means equivalent to the reduction in the price of cotton and other commodities.

Although the diminished exportation of cotton from the United States, which, as compared with that of last year, is 500,000 bales, had some slight effect on the prices, they were yet so low as to cause heavy losses to shippers; and the consumption of the first six months of 1839 had been on so small a scale that it is not possible for the increase of the second six months to absorb the stocks on hand on the 1st of August. The growing crop, therefore, which will doubtless be a very large one, must be sold at moderate prices compared with those which the planters have been accustomed to, and retard the payment of the large amount of debt contracted by the great cotton growing states in the south-west. The exports of the last crop have nearly ceased. Compared with those of 1838 they are as follows:

1839, to Great Britain, 785,000, France 230,000, other ports 30,000.
1838, to Great Britain, 1150,000, France 315,000, other ports 83,000.

The crop of the United States received in 1839 is 1,340,000, in 1838, 1,790,000.

Tobacco was also dull in the European markets, and the price was declining. The quantity inspected in Virginia in 1839 is about 27,000 against about 43,000 hhds. to same time in 1838. Prices have consequently declined here and may now be quoted $4.50 to $12, embracing all qualities. The export of the season has nearly ceased. The prospect for the growing crop is favorable, and it bids fair to be one of the largest ever produced.

The price of wheat is $1.10 to 1.20; the quality of that which has yet been brought to market in Virginia is much inferior to that of last year. The effect of the western crop is not yet felt. It is reported to be large and fine, and in the absence of a large export demand, the price must be low. This, however, will depend on the result of the English crop.

Of Indian corn the crop will be most bountiful, and in anticipation of this, the price has declined to about 60 cents per bushel.

Internal exchanges continue in a very deranged state. Stocks of every description are low beyond precedent, and commercial affairs in a gloomy state. X.

August 26.

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